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U.S. DEPARTMENT OF COMMERCE / National Oceanic and Atmospheric Administration

FEDERAL COORDINATOR FOR METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH

National Hurricane Operations Plan

FCM-P12-1985

Washington, D.C.
May 1985

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U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
FEDERAL COORDINATOR FOR METEOROLOGICAL
SERVICES AND SUPPORTING RESEARCH

NATIONAL HURRICANE OPERATIONS PLAN

FCM-P12-1985
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FOREWORD

An Interdepartmental Plan was first issued in 1962. This document is the 23rd edition and presents procedures and agreements reached at the 39th annual Interdepartmental Hurricane Conference held at the USAF Conference Center, Homestead Air Force Base, Florida, 8-11 January 1985.

The Conference is sponsored annually by the Committee for Basic Services, Interdepartmental Committee For Meteorological Services and Supporting Research, and brings together cognizant Federal agencies to achieve agreement on items of mutual concern related to hurricane warning services. The host this year for the Conference was Headquarters, 23rd Air Force, Scott AFB, Illinois.

William S. Barney
Federal Coordinator for
Meteorological Services and
Supporting Research

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Box 13983 NOAA.

NATIONAL HURRICANE OPERATIONS PLAN

(ATLANTIC, EASTERN PACIFIC, AND CENTRAL PACIFIC)

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CHAPTER 1

INTRODUCTION

1. General. The Tropical Cyclone Warning Service is an interdepartmental effort to provide the United States and designated international recipients with forecasts, warnings, and assessments concerning tropical and subtropical weather systems. The National Oceanic and Atmospheric Administration (NOAA) is responsible for providing forecasts and warnings for the Atlantic, and Eastern and Central Pacific Oceans, while the Department of Defense (DOD) provides the same for the West Pacific and Indian Oceans. Interdepartmental cooperation achieves economy and efficiency in the operation of the Tropical Cyclone Warning Service. This plan provides the basis for implementing the agreements of the Department of Commerce (DOC), Department of Defense, and the Department of Transportation (DOT) reached at the annual Interdepartmental Hurricane Conference (combined Atlantic and Pacific). The Hurricane Conference is sponsored by the Committee for Basic Services, Interdepartmental Committee for Meteorological Services and Supporting Research, to bring together cognizant Federal agencies and achieve agreement on items of mutual concern related to the Atlantic and Pacific Tropical Cyclone Warning Services.

2. Scope. The procedures and agreements contained herein apply to the Atlantic, Gulf of Mexico, Caribbean, and North Pacific east of the 180th meridian. This plan is intended to define the role of the individual agencies (organizations) participating in the hurricane warning service when more than one agency (organization) is involved in the delivery of service in any specific area. When a single agency (organization) is involved in any specific area, that agency's (organization's) procedures should be contained in internal documents and, to the extent possible, be consistent with NHOP practices and procedures.

3. Terms used in this Plan:

a. Center Fix. The location of the center of a tropical or subtropical cyclone obtained by means other than reconnaissance aircraft penetration.

b. Cyclone. An atmospheric closed-circulation rotating counterclockwise in the Northern Hemisphere.

c. Eye. The relatively calm center of a tropical cyclone which is more than 1/2 surrounded by wall cloud.

d. Hurricane Season. The portion of the year having a relatively high incidence of hurricanes. In the Atlantic, Caribbean, and Gulf of Mexico, this is the period from June through November; in the eastern Pacific, May 15 through November 30; and in the central Pacific the period from June through November.

e. Hurricane Warning Offices (HWO). The designated hurricane warning offices are: the National Hurricane Center, Miami, Florida; the Eastern Pacific Hurricane Center, Redwood City, California; and the Central Pacific Hurricane Center, Honolulu, Hawaii.

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f. Hurricane Warning. A warning that sustained winds of 74 miles an hour (64 knots) or higher associated with a hurricane are expected in a specified coastal area in 24 hours or less. A hurricane warning can remain in effect when dangerously high water or a combination of dangerourly high water and exceptionally high waves continue, even though winds may be less than hurricane force.

g. Hurricane Watch. An announcement for specific areas that a hurricane or an incipient hurricane condition poses a possible threat to coastal areas generally within 36 hours.

h. Miles. The term "miles" used in this plan refers to nautical miles unless otherwise indicated.

i. Mission Identifier. The nomenclature assigned to tropical and subtropical cyclone aircraft reconnaissance missions for weather data identification. It comprises an agency - aircraft indicator followed by a Chief, Aerial Reconnaissance Coordination, All Hurricane (CARCAH) assigned mission-system indicator.

j. Present Movement. The best estimate of the movement of the center of a tropical cyclone at a given time and at a given position. This estimate does not reflect the short-period, small-scale oscillations of the cyclone center.

k. Reconnaissance Aircraft Sorties. A flight which meets the requirements of the tropical cyclone plan of the day (TCPOD).

l. Relocated. A term used in an advisory to indicate that a vector drawn from the preceding advisory position to the latest-known position is not necessarily a reasonable representation of the cyclone's movement.

m. Storm Surge. An abnormal rise in sea level accompanying a hurricane or other intense storm, and whose height is the difference between the observed level of the sea surface and the level that would have occurred in the absence of the storm. Storm surge is usually estimated by substracting the normal or astronomic tide from the observed storm tide.

n. Storm Tide. The actual level of sea water resulting from the astronomic tide combined with the storm surge.

o. Subtropical Cyclone. A low-pressure system developing over subtropical waters which initially has a non-tropical circulation but in which some elements of tropical cyclone cloud structure are present.

(1) Subtropical Depression. A subtropical cyclone in which the maximum sustained surface wind (1-minute mean) is 33 knots (38 statute mph) or less.

(2) Subtropical Storm. A subtropical cyclone in which the maximum sustained surface wind (1-minute mean) is 34 knots (39 statute mph) or greater.

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p. Synoptic Track. Weather reconnaissance mission flown to provide vital meteorological information in data sparse ocean areas as a supplement to existing surface radar and satellite data. Synoptic flights better defire the upper atmosphere and aid in the prediction of tropical cyclone development and movement.

q. Tropical Cyclone Plan of the Day. A coordinated mission plan that tasks operational weather reconnaissance requirements during the next 05Z to 05Z day or as required; describes reconnaissance flights committed to satisfy both operational and research requirements; and identifies possible reconnaissance requirements for the succeeding 24-hour period.

r. Tropical Weather Systems:

(1) Tropical Disturbance. A discrete system of apparently organized convection--generally 100 to 300 miles in diameter--originating in the tropics or subtropics, having a nonfrontal migratory character and maintaining its identity for 24 hours or more. It may or may not be associated with a detectable perturbation of the wind field. As such, it is the basic generic designation, which in successive stages of intensification, may be classified as a tropical wave, depression, storm, or hurricane.

(2) Tropical Wave. A trough or cyclonic curvature maximum in the trade-wind easterlies. The wave may reach maximum amplitude in the lower middle troposphere or may be the reflection of an upper troposphere cold-low or equatorial extension of a middle-latitude trough.

(3) Tropical Cyclone. A warm-core, nonfrontal low pressure system of synoptic scale developing over tropical or subtropical waters and having a definite organized circulation.

(a) Tropical Depression. A tropical cyclone in which the maximum sustained surface wind (1-minute mean) is 33 knots (38 statute mph) or less.

(b) Tropical Storm. A tropical cyclone in which the maximum sustained surface wind (1-minute mean) ranges from 34 knots (74 statute mph) or more.

s. Vortex Fix. The location of the surface and/or flight level center of a tropical or subtropical cyclone obtained by reconnaissance aircraft penetration.

t. Wall Cloud. An organized band of cumuliform clouds immediately surrounding the center of a tropical cyclone. Wall cloud and eye wall are used synonymously.

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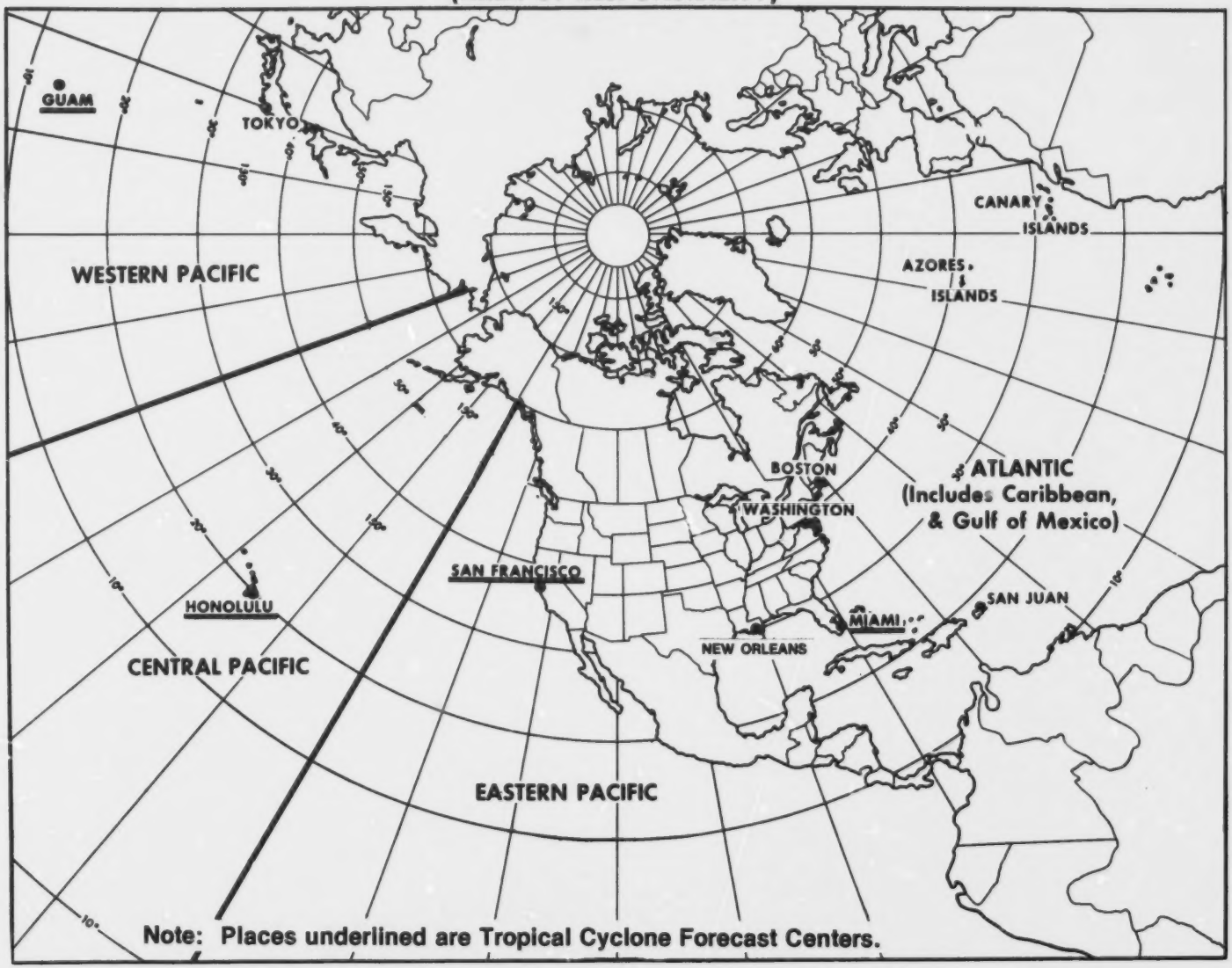
NATIONAL HURRICANE OPERATIONS PLAN

(AREA OF RESPONSIBILITY)



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CHAPTER 2

RESPONSIBILITIES OF COOPERATING FEDERAL AGENCIES

1. General. The Department of Commerce is charged with the overall responsibility for the implementation of a responsive, effective national hurricane warning system. Many local, state and Federal agencies play a vital role in this system -- their cooperative efforts help insure necessary preparedness actions are undertaken to minimize loss of life and property destruction. The joint participation by the Department of Defense and the Department of Transportation with the Department of Commerce brings to bear those limited and expensive Federal resources considered essential to storm detection and accurate forecasting. This cooperative effort has proven to be a cost-effective, highly responsive endeavor to meet national requirements for hurricane warning information.

2. Department of Commerce (DOC) Responsibilities. The DOC will:

a. Provide timely dissemination of forecasts, warnings and all significant information regarding tropical and subtropical cyclones to appropriate agencies, general public, marine, and aviation interests.

b. Through the National Weather Service (NWS), provide the following additional support/services to the Department of Defense (DOD):

(1) Consult, as necessary, with DOD regarding their day-to-day requirements for cyclone assessments and attempt to meet these requirements within the capabilities of the Hurricane Warning Service.

(2) Prepare, through the National Hurricane Center (NHC), and distribute to DOD the coordinated DOC reconnaissance and other meteorological data requirements to be provided by DOD on tropical/subtropical cyclones and disturbances.

(3) Provide facilities, administrative support, and dissemination of weather observation data for Operating Location-G (OL-G), Air Weather Service (AWS) as agreed to by DOC and DOD.

(4) Provide DOD with basic meteorological information, warnings, forecasts, and associated prognostic reasoning concerning location, intensity and forecast movement of tropical and subtropical cyclones in the following maritime areas and adjacent states and possessions of the United States:

(a) Atlantic Ocean (north of the Equator including Caribbean Sea and Gulf of Mexico) - advices are the responsibility of the Director, NHC, Miami, FL. (NHC will consult with Naval Eastern Oceanography Center (NAVEASTOCEANCEN) Norfolk, VA, prior to issuance of an initial and final advisories and prior to issuance of any advisory which indicates a significant change in forecast of intensity or track from the last advisory.) Exchange of information is encouraged on subsequent warnings when significant changes are made, or as otherwise required.

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(b) Eastern Pacific Ocean (north of the Equator and east of 140°W) - advices are the responsibility of the Director, Eastern Pacific Hurricane Center (EPHC), Redwood City, CA. [EPHC will consult with Naval Western Oceanography Center (NAVWESTOCEANCEN), Pearl Harbor, HI, before issuance of initial and final advisories and prior to issuance of any advisory which indicates a significant change in forecast of intensity or track from last advisory.]

(c) Central Pacific Ocean (north of the Equator between 140°W and 180°) - advices are the responsibility of Director, Central Pacific Hurricane Center (CPHC), Honolulu, HI. [CPHC will consult with NAVWESTOCEANCEN Pearl Harbor, HI, and Detachment 4, 20th Weather Squadron, Hickam AFB, HI, before issuance of an initial and final advisories and prior to issuance of any advisory which indicates a significant change in forecast of intensity or track from last advisory.] Exchange of information is encouraged on subsequent warnings when significant changes are made, or as otherwise required.

c. Through the NWS, conduct an annual post analysis for all tropical cyclones in the Atlantic and the Pacific regions east of 180° and prepare an annual hurricane report for issuance to interested agencies.

d. Through the National Environmental Satellite, Data, and Information Service (NESDIS), operate DOC environmental satellite systems capable of providing coverage of meteorological conditions in the Tropics during the tropical cyclone season, and monitor and interpret DOC satellite imagery. Obtain as necessary National Aeronautic and Space Administration (NASA) research/development satellite and DOD operational satellite data for NWS operational use. Comply with NHC, EPHC, and CPHC satellite data requirements.

e. Through the National Oceanic and Atmospheric Administration (NOAA) Data Buoy Center (NDBC), develop, deploy, and operate environmental data buoy systems to support data requirements of NHC, EPHC, and CPHC.

f. Through the NOAA Office of Aircraft Operations (OAO), provide weather reconnaissance flights as specified in Chapter 5, unless relieved of these responsibilities by the Administrator of the National Oceanic and Atmospheric Administration.

g. Through NOAA, reimburse the U.S. Air Force (USAF) for the aircraft reconnaissance flown in support of this plan in accordance with the NOAA/USAF memorandum of understanding, dated 16 March 1976 (see Appendix II).

3. Department of Defense (DOD) Responsibilities. The DOD will:

a. Provide NWS with timely dissemination of significant information received regarding tropical and subtropical cyclones.

b. Provide NHC, EPHC, and CPHC current DOD requirements for tropical and subtropical cyclone advices.

c. Meet DOC requirements for aircraft reconnaissance and other special observations as agreed to by DOD and DOC (see Appendix II).

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d. Provide at NHC a 24-hour aircraft operation interface as necessary, (Chief, Aerial Reconnaissance Coordination, All Hurricanes--CARCAH).

e. Designate OL-G, AWS as the liaison to NHC and the military point of contact for NHC to request special DOD observations in support of this Plan, i.e., Defense Meteorological Satellite Program (DMSP) fixes, additional upper air observations, etc.

f. Provide broadcast facilities of radio station NAM for tropical storm and hurricane forecasts and warnings.

g. Provide access to North American Aerospace Defense (NORAD) Command long- range radar sites (See Chapter 7).

h. Provide weather reconnaissance data monitor services to evaluate and disseminate reconnaissance reports.

i. AFGWC, through analysis of satellite imagery obtained primarily from the DMSP system, will provide surveillance support and fixes/intensity estimates to all United States tropical cyclone warning agencies.

4. Department of Transportation (DOT) Responsibilities. The DOT will:

a. Provide NWS with timely dissemination of significant information received regarding tropical and subtropical cyclones.

b. Through the Federal Aviation Administration (FAA), provide air traffic control, communication, and flight assistance services.

c. Through the U.S. Coast Guard, provide personnel, vessel, and communication support to NDBC for development, deployment, and operation of moored environmental data buoy systems; provide surface observations to NWS from its coastal facilities and vessels; provide communication circuits for relay of weather observations to NWS in selected areas; provide primary guard Autodin support to OL-G, AWS; and provide coastal broadcast facilities at selected locations for tropical storm/hurricane forecasts and warnings.

5. DOD, DOC, and DOT will cooperate in arranging an annual trip to the Caribbean and the Gulf of Mexico area to carry out a continuing and effective liaison of the warning service with the Directors of Meteorological Services, Air Traffic Control Agencies, and Disaster Preparedness Agencies of nations in those areas.

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Hurricane DIANIA, as viewed by GOES
West at 2030Z, September 11, 1984

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CHAPTER 3

GENERAL OPERATIONS AND PROCEDURES OF THE
NATIONAL WEATHER SERVICE
HURRICANE CENTERS

1. General. This chapter describes the products, procedures, and communications headers used by the National Hurricane Center (NHC), Eastern Pacific Hurricane Center (EPHC), and the Central Pacific Hurricane Center (CPHC).

2. Products.

a. Tropical Weather Outlook. Issued by NHC, CPHC, and EPHC during their respective hurricane seasons. In the Atlantic, it is transmitted at 0530, 1130, 1730, and 2230 Eastern Local Time (ELT). In the Central Pacific, it is transmitted at 1000Z and 2200Z. In the Eastern Pacific, it is transmitted at 1000Z and 2130Z. The outlook will briefly describe both stable and potentially unstable areas out to 48 hours. A tropical weather summary of Atlantic tropical cyclone activity will be prepared and issued at the end of each month during the hurricane season.

b. Tropical Cyclone Discussion.

(1) NHC will issue a Tropical Cyclone Discussion on Atlantic tropical cyclones at 0330Z, 0930Z, 1530Z, and 2130Z. Discussion will be disseminated for intragovernmental use only and will contain preliminary prognostic positions up to 72 hours; will describe objective techniques, synoptic features, and climatology used; and will provide reasons for track changes.

(2) EPHC and CPHC will issue a Tropical Cyclone Discussion twice daily. EPHC will issue discussions not later than 0900Z and 2100Z. CPHC will issue the discussions not later than 0330Z and 1530Z. The discussion will describe objective techniques, synoptic features and climatology used; and will provide reasons for track changes.

c. Public Advisories. Issued by NHC for all tropical storms and hurricanes, and for tropical depressions or subtropical storms threatening land in the Gulf of Mexico, Caribbean, or western North Atlantic areas. In the Pacific, public advisories are issued for storms and hurricanes that are expected to affect the United States within 48 hours. Scheduled public advisories are issued at the same time scheduled marine advisories are issued. When no coastal warnings are included, the 0400Z public advisory will be issued at 0230Z by NHC only. [Note: Public Advisories use statute miles for distance and miles per hour for speed. Nautical miles and knots may be added at the discretion of the Centers.]

d. Marine Advisories. Issued by NHC, EPHC, and CPHC. See chapter 4.3 for content and format of the advisories. Marine Advisories will be transmitted to high-seas shipping according to the details found in Worldwide Marine Weather Broadcasts, jointly published by U.S. Navy (USN) and NWS.

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e. Probability of Hurricane/Tropical Storm Conditions.

(1) The probability of the storm center passing within 50 miles to the right or 75 miles to the left of specific forecast points within 24, 36, 48, and 72 hours is included in the marine and public advisories for all named storms in the Atlantic and the Gulf of Mexico. Probabilities may also be included for yet to be named storms that are developing rapidly near a coast line, dependent upon NHC assessment. Probabilities will not be included on intermediate public advisories. The probabilities, which are based on the official forecast track, will be issued when the 72-hour forecast position approaches the coast and will continue until the hurricane has made landfall and is not expected to reemerge over water. For storms forecast to parallel the coast, maximum value over water points will be included. NHC retains the right to discontinue issuance of probabilities earlier if other factors arise, such as difficulties with evacuation orders.

(2) The probabilities will be computed shortly after synoptic times for the periods 0-24, 24-36, 36-48, and 48-72. A total probability for the next 72 hours will be shown in the last column and represents a total of all forecast periods. If the probability of a storm hitting a coastal location within 48 hours is needed, add the 0-24, 24-36, and 36-48 hour probabilities. If the probability for a location is less than one percent, a "X" will be indicated in the table.

(3) When appropriate, specific probabilities will be computed for the following locations:

Brownsville, Texas	West Palm Beach, Florida
Corpus Christi, Texas	Fort Pierce, Florida
Port O'Connor, Texas	Cocoa Beach, Florida
Galveston, Texas	Daytona Beach, Florida
Port Arthur, Texas	Jacksonville, Florida
New Iberia, Louisiana	Savannah, Georgia
New Orleans, Louisiana	Myrtle Beach, South Carolina
Buras, Louisiana	Charleston, South Carolina
Gulfport, Mississippi	Wilmington, North Carolina
Mobile, Alabama	Cape Hatteras, North Carolina
Pensacola, Florida	Norfolk, Virginia
Panama City, Florida	Ocean City, Maryland
Apalachicola, Florida	Atlantic City, New Jersey
St. Marks, Florida	New York, New York
Cedar Key, Florida	Montauk Point, New York
Tampa, Florida	Providence, Rhode Island
Venice, Florida	Nantucket, Massachusetts
Fort Myers, Florida	Hyannis, Massachusetts
Marco Island, Florida	Boston, Massachusetts
Key West, Florida	Portland, Maine
Marathon, Florida	Bar Harbor, Maine
Miami, Florida	Eastport, Maine
29°N 85°W	28°N 93°W
29°N 87°W	28°N 95°W
28°N 89°W	27°N 96°W
28°N 91°W	25°N 97°W

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f. Tropical Cyclone Updates. Tropical cyclone updates are brief statements in lieu of or preceding special advisories to inform of significant changes in a tropical cyclone or the posting or cancellation of watches and warnings.

g. Atlantic and Gulf of Mexico Tropical Cyclone Position Estimates. NHC may also issue hourly Tropical Cyclone Position Estimates when the tropical cyclone is under effective surveillance and within 200 nautical miles of land-based radar. These estimates when issued will be prepared a short time before each hour except at hours when advisories are issued. Position estimates will be disseminated to the public, DOD, and other Federal agencies will provide geographical positions in latitude and longitude, and also by distance and direction from a well-known point.

h. Special Tropical Disturbance Statement. Special tropical disturbance statements are issued to furnish information on strong formative, non-depression systems.

i. Storm Summaries. Storm summaries are written by the National Severe Storms Forecast Center (NSSFC) after subtropical and tropical cyclones have moved inland and public advisories have been discontinued. Storm summaries will continue to be numbered in sequence with public advisories on named storms. Also, these summaries will reference the former storm's name and be issued as long as the remnants of the storm remain a serious flooding threat. Storm summaries will be transmitted at 0500Z, 1100Z, 1700Z, and 2300Z.

3. Designation of Tropical and Subtropical Cyclones.

a. Numbering of Depressions. Each depression will be assigned a number that will be retained throughout the life of the cyclone. This depression number will not, however, be disseminated on advices after a depression is named as a tropical storm/hurricane or is numbered as a subtropical storm. For each hurricane center's area, numbering will begin with 01 at the start of each calendar year. When forecast responsibility is passed from one warning center too another, the assigned number will be retained.

(1) For the Atlantic, Caribbean, and Gulf of Mexico, depression numbers will be assigned by NHC after advising the NAVEASTOCEANCEN, Norfolk.

(2) For the Pacific area east of longitude 140°W, depression numbers, (with the suffix E, i.e., 1E, 2E, 3E, etc.) will be assigned by EPHC after advising the NAVWESTOCEANCEN, Pearl Harbor.

(3) For the Pacific area west of longitude 140°W and east of 180°, depression numbers (with suffix C, i.e., 1C, 2C, 3C, etc.) will be assigned by CPHC after advising the NAVWESTOCEANCEN, Pearl Harbor.

(4) For the Pacific area west of longitude 180°, depression numbers are assigned by the Joint Typhoon Warning Center (JTWC), Guam.

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b. Naming of Tropical Storms and Hurricanes.

(1) Atlantic and Eastern Pacific. A different set of names will be used each year. After a set is used, it will drop to the end of the list, to be used again in six years, except names of significant hurricanes will be retired and replaced with another. Lists of Atlantic and East and Central Pacific names are provided in Appendix A to this chapter.

(2) Central Pacific. When a tropical depression intensifies into a tropical storm or hurricane between longitude 140°W and the 180th meridian, the depression number will be discontinued and replaced by an appropriate name. The CPHC will select the name from the Central Pacific names in Appendix A to this chapter. All of the names listed in eahc column, beginning with colunm 1, will be used before going to the next column.

(3) Western Pacific. For the Pacific area west of longitude 180°, tropical storms and typhoons are named by the Joint Typhoon Warning Center (JTWC), Guam. The names are listed in Appendix A to this chapter for information only.

c. Numbering of Subtropical Storms. When a system becomes a subtropical storm, it will be assigned a storm number to indicate its sequence of occurrence among subtropical storms for that area. Numbering will begin with 1 and be consecutive, returning to 1 each new year.

4. Transfer of Warning Responsibility.

a. When a tropical/subtropical cyclone approaches longitude 140°W, the coordinated transfer of warning responsibility from Eastern Pacific Hurricane Center (EPHC) to Central Pacific Hurricane Center (CPHC) will be made and the appropriate advice issued.

b. When a tropical/subtropical cyclone crosses the 180° meridian from east to west, the coordinated transfer of warning responsibility from CPHC to Joint Typhoon Warning Center (JTWC) will be made and appropriate advice issued.

c. When a tropical/subtropical cyclone crosses the 180° meridian from west to east, the coordinated transfer of warning responsibility from JTWC to CPHC will be made. JTWC will append the statement "Next advisory by CPHC-HNL" to their last advisory.

5. Alternate Warning Responsibilities.

a. In the event of impending or actual operational failure of a hurricane forecast center, responsibilities will be transferred to the appropriate alternate facility in accordance with existing directives and retained there until resumption of responsibility is made. Naval Eastern Oceanography Center, Norfolk, will be advised by National Hurricane Center (NHC) and Chief, Aerial Reconnaissance Coordination, All Hurricanes (CARCAH) of impending or actual transfer of responsibility by the most rapid means available.

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b. Alternate facilities are as follows:

PRIMARY	ALTERNATE
(1) NHC	WSFO Washington (covers Atlantic only) WSFO New Orleans (covers Gulf of Mexico and Caribbean)
(2) EPHC	NHC
(3) CPHC	EPHC
(4) JTWC	AJTWC, NAVWESTOCEANCEN, Pearl Harbor

c. In the event of the operational failure of CARCAH, direct communication is authorized between DET1,7WW and the forecast facility. Contact Detachment 5, AWS, at AV 868-2544/CO 601-377-2544, or through the Keesler AFB Command Post at AV 868-4330/CO 601-377-4330.

6. Abbreviated Communications Headings. Abbreviated communications headings are assigned to advisories on tropical and subtropical cyclones and other advices based on depression number (or storm name) and standard communication procedures. [Note: An abbreviated heading consists of three groups with ONE space between second and third groups. The first group contains a data type indicator (e.g., WH for hurricane), a geograpical indicator (e.g., CA for Caribbean), and a number. The second group contains a location indicator of the message originator (e.g., KMIA for Miami). The third group is a date-time group in GMT. An example of a complete header is WHCA31 KMIA 180400.

a. Atlantic.

ABCA20 KMIA	Tropical Weather Outlook and Tropical Weather Summary (Monthly)
WTCA41-45 KMIA	Tropical Cyclone Discusssion
WTCA31-35 KMIA	Public Advisory
WTCA21-25 KMIA	Marine Advisory
WWCA21-25 KMIA	Subtropical Storm Advisory
WTXX61 KMIA	Tropical Cyclone Update
WTXX51 KMIA	Tropical Cyclone Position Estimate
WOCA41 KMIA	Special Tropical Disturbance Statement
WTXX90 KMIA	Tropical Cyclone Discussion for WMO Region IV Stations

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11.

b. East and Central Pacific.

(1) All advisories on hurricanes, tropical storms, and depressions are under WT abbreviated headings as follows:

WTPA21-25 KSFO	Marine
WTPA21-25 PHNL	Marine
WTPA31-35 KSFO	Public
WTPA31-35 PHNL	Public

(2) Depressions are numbered internally and storms are named internally, but the number in the abbreviated headings does not relate to either the internal number of the depression or the name of the storm. The first cyclone would have 21 and 31 in the abbreviated headings, the second cyclone would have 22 and 32, the sixth cyclone would have 21 and 31, etc. The abbreviated heading would not change when a depression is upgraded to storm status.

WHXX41-45 KSFO	Tropical Cyclone Discussion
WHXX41-45 PHNL	Tropical Cyclone Discussion
WHXX51 KSFO	Tropical Cyclone Position Estimate
WHXX51 PHNL	Tropical Cyclone Position Estimate
WHXX61 KSFO	Tropical Cyclone Update
WHXX61 PHNL	Tropical Cyclone Update
WOPN41 KSFO	Special Tropical Disturbance Statement
WOPN41 PHNL	Special Tropical Disturbance Statement
WWPN21-25 PHNL	Subtropical Storm Advisory

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1985	1986	1987	1988	1989	1990
ANA	ANDREW	ARLENE	ALBERTO	ALLISON	ARTHUR
BOB	BONNIE	BRET	BERYL	BARRY	BERTHA
CLAUDETTE	CHARLEY	CINDY	CHRIS	CHANTAL	CESAR
DANNY	DANIELLE	DENNIS	DEBBY	DEAN	DIANA
ELENA	EARL	EMILY	ERNESTO	ERIN	EDOUARD
FABIAN	FRANCES	FLOYD	FLORENCE	FELIX	FRAN
GLORIA	GEORGES	GERT	GILBERT	GABRIELLE	GUSTAV
HENRI	HERMINE	HARVEY	HELENE	HUGO	HORRTENSE
ISABEL	IVAN	IRENE	ISAAC	IRIS	ISIDORE
JUAN	JEANNE	JOSE	JOAN	JERRY	JOSEPHINE
KATE	KARL	KATRINA	KEITH	KAREN	KLAUS
LARRY	LISA	LENNY	LESLIE	LUIS	LILI
MINDY	MITCH	MARIA	MICHAEL	MARILYN	MARCO
NICHOLAS	NICOLE	NATE	NADINE	NOEL	NANA
ODETTE	OTTO	OPHELIA	OSCAR	OPAL	OMAR
PETER	PAULA	PHILIPPE	PATTY	PABLO	PALOMA
ROSE	RICHARD	RITA	RAFAEL	ROXANNE	RENE
SAM	SHARY	STAN	SANDY	SEBASTIEN	SALLY
TERESA	TOMAS	TAMMY	TONY	TANYA	TEDDY
VICTOR	VIRGINIE	VINCE	VALERIE	VAN	VICKY
WANDA	WALTER	WILMA	WILLIAM	WENDY	WILFRED

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1985	1986	1987	1988	1989	1990
ANDRES	AGATHA	ADRIAN	ALETTA	ADOLPH	ALMA
BLANCA	BLAS	BEATRIZ	BUD	BARBARA	BORIS
CARLOS	CELIA	CALVIN	CARLOTTA	COSME	CRISTINA
DOLORES	DARBY	DORA	DANIEL	DALILIA	DOUGLAS
ENRIQUE	ESTELLE	EUGENE	EMILIA	ERICK	ELIDA
FEFA	FRANK	FERNANDA	FABIO	FLOSSIE	FAUSTO
GUILLERMO	GEORGETTE	GREG	GILMA	GIL	GENEVIEVE
HILDA	HOWARD	HILARY	HECTOR	HENRIETTE	HERNAN
IGNACIO	ISIS	IRWIN	IVA	ISMAEL	ISELLE
JIMENA	JAVIER	JOVA	JOHN	JULIETTE	JULIO
KEVIN	KAY	KNUT	KRISTY	KIKO	KENNA
LINDA	LESTER	LIDIA	LANE	LORENA	LOWELL
MARTY	MADELINE	MAX	MIRIAM	MANUEL	MARIE
NORA	NEWTON	NORMA	NORMAN	NARDA	NORBERT
OLAF	ORLENE	OTIS	OLIVIA	OCTAVE	ODILE
PAULINE	PAINE	PILAR	PAUL	PRISCILLA	POLO
RICK	ROSLYN	RAMON	ROSA	RAYMOND	RACHEL
SANDRA	SEYMOUR	SELMA	SERGIO	SONIA	SIMON
TERRY	TINA	TODD	TARA	TICO	TRUDY
VIVIAN	VIRGIL	VERONICA	VICENTE	VELMA	VANCE
WALDO	WINIFRED	WILEY	WILLA	WINNIE	WALLIS

Column 1		Column 2		Column 3		Column 4	
Name	Pronunciation	Name	Pronunciation	Name	Pronunciation	Name	Pronunciation
AKONI	ah-KOH-nee	AKA	AH-kah	ALIKA	ah-LEE-kah	ANA	AH-nah
EMA	EH-mah	EKEKA	eh-KEH-kah	ELE	EH-leh	ELA	EH-lah
HANA	HAH-nah	HALI	HAH-lee	HUKO	HOO-koh	HALOLA	hah-LOH-lah
IO	EE-oo	INIKI	ee-NEE-kee	IOKE	ee-OH-keh	IUNE	ee-OO-neh
KELI	KEH-lee	KEONI	keh-OH-nee	KIKA	KEE-kah	KIMO	KEE-moh
LALA	LAH-lah	LI	LEE	LANA	LAH-nah	LOKE	LOH-keh
MOKE	MOH-keh	MELE	MEH-leh	MAKA	MAH-kah	MALIA	mah-LEE-ah
NELE	NEH-leh	NONA	NOH-nah	NEKI	NEH-kee	NIALA	nee-AH-lah
OKA	OH-kah	OLIWA	oh-LEE-vah	OLEKA	oh-LEH-kah	OKO	OH-koh
PEKE	PEH-keh	PAKA	PAH-kah	PENI	PEH-nee	PALI	PAH-lee
ULEKI	oo-LEH-kee	UPANA	oo-PAH-nah	ULIA	oo-LEE-ah	ULIKA	oo-LEE-kah
WILA	VEE-lah	WENE	WEH-neh	WALI	WAH-lee	WALAKA	wah-LAH-kah

NOTE: Use Column 1 list of names until exhausted before going on to Column 2, etc.
All letters in the Hawaiian language are pronounced including double or triple vowels.

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COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
ANDY	ABBY	ALEX	AGNES
BRENDA	BEN	BETTY	BILL
CECIL	CARMEN	CARY	CLARA
DOT	DOM	DINAH	DOYLE
ELLIS	ELLEN	ED	ELSIE
FAYE	FORREST	FREDA	FABIAN
GORDON	GEORGIA	GERALD	GAY
HOPE	HERBERT	HOLLY	HAL
IRVING	IDA	IAN	IRMA
JUDY	JOE	JUNE	JEFF
KEN	KIM	KELLY	KIT
LOLA	LEX	LYNN	LEE
MAC	MARGE	MAURY	MAMIE
NANCY	NORRIS	NINA	NELSON
OWEN	ORCHID	OGDEN	ODESSA
PEGGY	PERCY	PHYLLIS	PAT
ROGER	RUTH	ROY	RUBY
SARAH	SPERRY	SUSAN	SKIP
TIP	THELMA	THAD	TESS
VERA	VERNON	VANESSA	VAL
WAYNE	WYNNE	WARREN	WINONA

ONE

(a) WINDS* 75-95 mph at standard anemometer elevations (F-scale 1.0-1.4). **Damage primarily to shrubbery, trees, foliage, and unanchored mobile homes. No real damage to building structures. Some damage to poorly constructed signs, or

(b) STORM SURGE (nominally 4-5 feet above normal). Low-lying coastal roads inundated, minor pier damage, some small craft in exposed anchorages break moorings.

TWO

(a) WINDS 96-110 mph at standard anemometer elevations (F-scale 1.5-1.9). Considerable damage to shrubbery and tree foliage, some trees blown down. Major structural damage to exposed mobile homes. Extensive damage to poorly constructed signs. Some damage to roofing material, windows, and doors; no major damage to building structure or

(b) STORM SURGE (nominally 6-8 feet above normal). Coastal roads and low-lying escape routes inland cut by rising water 2-4 hours before arrival of center. Considerable pier damage, marinas flooded. Small craft in unprotected anchorages break moorings. Evacuation of some shoreline residences and low-lying island areas required.

THREE

(a) WINDS 111-130 mph at standard anemometer elevations (F-scale 2.0-2.4) Damage to shrubbery and trees. Foliage off trees, large trees blown down. Practically all poorly constructed signs blown down, some roofing material damage, some window and door damage, some structural damage to small residences and utility buildings, and mobile homes destroyed. Minor amount of curtainwall failures, or

(b) STORM SURGE (nominally 9-12 feet above normal). Serious flooding at coast with many smaller structures near coast destroyed. Larger structures damaged by battering of floating debris. Low-lying escape routes inland cut by rising water 3-5 hours before center arrives. Terrain continuously lower than 5 feet above sea level may be flooded inland 8 miles or more. Evacuation of low-lying residences within several blocks of the shoreline may be required.

FOUR

(a) WINDS 131-155 mph at standard anemometer elevations (F-scale 2.5-2.9). Shrubs and trees down, all signs down. Extensive roofing material damage, extensive window and door damage, complete failure of roof structures on many small residences, and complete destruction of mobile homes. Some curtainwall failure, or

(b) STORM SURGE (nominally 13 to 18 feet above normal). Terrain continuously lower than 10 feet above sea level may be flooded inland as far as 6 miles. Major damage to lower floors of structures near the shore due to flooding and battering action. Low-lying escape routes inland cut by rising water 3-5 hours before center arrives. Major erosion of beach areas. Massive evacuation of all residences within 500 yards of the shoreline may be required and of single-story residences on low ground within 2 miles of the shoreline.

FIVE

(a) WINDS greater than 155 mph at standard anemometer elevations (F-scale 3.0 or greater). Shrubs and trees down, roofing damage considerable, all signs down. Very severe and extensive window and door damage. Complete failure of roof structures on many residences and industrial buildings. Extensive glass failures, some complete building failures, small buildings overturned and blown over or away, and complete destruction of mobile homes, or

(b) STORM SURGE (height nominally greater than 18 feet above normal). Major damage to lower floors of all structures located less than 15 feet above sea level and within 500 yards of the shoreline. Low-lying escape routes inland cut by rising water 3-5 hours before center arrives. Massive evacuations of residential areas situated on low ground within 5-10 miles of the shoreline may be required.

---

* Definition of a sustained wind (from Fujita and Simpson 1972) - A sustained wind is one that persists for the minimum time period to establish optimal dynamic forces on a nominal building structure.

** T. Fujita, 1971: "Proposed Characterization of Tornadoes and Hurricanes by Area and Intensity," University of Chicago (SMRP) Research Paper No. 91.

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CHAPTER 4

NATIONAL WEATHER SERVICE PRODUCTS FOR THE DEPARTMENT OF DEFENSE

1. General. The DOD and DOC weather forecasting, reconnaissance, and distribution agencies share technical information and some responsibilities. Mutually supportive relationships have developed over the years and have resulted into a mutual dependency. Due to the nature and distribution of DOD resources and operations, the DOD requires certain meteorological information beyond that available to the general public. Accordingly, the DOC provides DOD with special observations and advisories on tropical and subtropical storms threatening DOD resources or operations.

2. Observations. The National Hurricane Center (NHC), Eastern Pacific Hurricane Center (EPHC), and Central Pacific Hurricane Center (CPHC) will make available to DOD all significant tropical/subtropical cyclone observations that they receive.

3. Marine Advisories.

a. General. NHC, EPHC, and CPHC will provide DOD forecasts and related information for tropical and subtropical weather disturbances of depression intensity or greater. Forecasts will include advice as to location, movement, intensity, and dimension of these disturbances. Marine advisories will be disseminated through the NWS weather communications facility at Suitland, MD, to the Automated Weather Network (AWN) at Carswell AFB, TX, for further relay to DOD agencies. DOD forecasters who must give advice concerning an imminent operational decision may contact the appropriate Hurricane Center forecaster (see Chapter 2) when published marine advisories require elaboration. Phone numbers for the NHC/EPHC/CPHC are included in Appendix C to Chapter 5.

b. Marine Advisory Issue Frequency. The first marine advisory will normally be issued when meteorological data indicate that a tropical or subtropical cyclone has formed. Subsequent advisories will be issued at 0400Z, 1000Z, 1600Z, and 2200Z, (0300Z, 0900Z, 1500Z, 2100Z in the Eastern and Central Pacific). Advisories will continue to be issued until the system degenerates below depression level. In addition, special advisories will be issued whenever the following criteria are met (remarks stating the reason for the special advisory or the relocation will be mandatory in all special advisories or advisories that include a relocated position):

(1) Conditions require a hurricane watch or warning to be issued.

(2) A tropical depression becomes a tropical storm or vice versa.

(3) A tropical storm changes to a hurricane or vice versa.

(4) Conditions require initiation or upgrading of an existing coastal warning.

(5) A tornado threat develops or becomes non-existant.

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(6) Any other circumstances causing the hurricane forecaster to believe other significant changes have occurred.

NOTE: Tropical Cyclone Updates are permitted without the requirement of a special advisory, including when coastal warnings are cancelled. However, in some cases a special advisory may follow.

c. Marine Advisory Content. Marine advisories will contain appropriate information as shown in Appendix A of this chapter (Form 1 -- WS Form C-13). Advisories will contain 12- and 24-hour forecasts and, when appropriate, 48- and 72-hour outlooks valid from times based on the latest 6-hourly synoptic time. At a minimum, advisories in which the winds are forecast to be greater than 33 knots within 24 hours will include outlooks through 72 hours.

d. Numbering of Advisories. All advisories will be numbered sequentially in the Eastern and Central Pacific; i.e., Advisory Number 1 on tropical depression (TD) 1, Advisory Number 2 on TD 1, Advisory Number 3 on Tropical Storm Anita, Advisory Number 4 on Hurricane Anita, Advisory Number 5 on TD Anita, etc. The CPHC will append an alphabetic designator for intermediate advisories (e.g., 20A). In the Atlantic, Caribbean, and Gulf of Mexico advisories will be numbered consecutively beginning with each new depression. Special advisories will be numbered, but intermediate advisories will not be numbered. When the depression is numbered as a subtropical storm or named, the advisory numbering will revert to 1 and start all over again. In both the Atlantic and Pacific, once the system is named, however, that name will be retained on marine advisories until no further advisories are issued on that system; advisory numbering will continue sequentially.

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WS FORM C-13
(3-80)
(PRES. BY WSOM C-41)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

MILITARY/MARINE/AVIATION HURRICANE ADVISORY

NOTE: *Gusts included when maximum sustained winds reach 50 knots. Use of Quadrants is optional in East and Central Pacific. Twelve hour forecast not included for Atlantic Depressions and Subtropical Storms.* *For use in Pacific only.

Subtropical Depression
Subtropical Storm
Tropical Depression _____ Military/Marine/Aviation Advisory _____ Corrected _ Special
Tropical Storm (Name/Number) (Number)
Hurricane

NATIONAL WEATHER SERVICE _____ (City) _____ (State)

_____ (Time) Z _____ (Month) _____ (Day) _____ (Year)

(WARNINGS)

DEPRESSION, STORM, HURRICANE CENTER LOCATED/RELOCATED _____ NORTH _____ WEST AT _____ Z.
POSITION BASED ON AF RECONNAISSANCE TIME OF FIX _____ Z.
NOAA RECONNAISSANCE TIME OF FIX _____ Z.
ACCURATE WITHIN _____ NM — LAND BASED RADAR — ACFT RADAR — SATELLITE — SHIP REPORT — SYNOPTIC REPORT — EXTRAPOLATION

Remarks

NOTE: Leave 3 spaces after each latitude and longitude entry.

PRESENT MOVEMENT _____ OR _____ DEGREES AT _____ KT.
DIAMETER OF EYE _____ NM (If known)
MAXIMUM SUSTAINED WINDS _____ KT WITH GUSTS TO _____ KT.
*RADIUS OF 100 KT WINDS _____ NE _____ SE _____ SW _____ NW.
RADIUS OF 64 KT WINDS _____ NE _____ SE _____ SW _____ NW.
RADIUS OF 50 KT WINDS _____ NE _____ SE _____ SW _____ NW.
RADIUS OF 34 KT WINDS _____ NE _____ SE _____ SW _____ NW.
RADIUS OF SEAS 12 FT OR HIGHER _____ NE _____ SE _____ SW _____ NW.
REPEAT CENTER LOCATED/RELOCATED NEAR _____ N _____ W AT _____ Z.

FORECAST VALID _____ Z _____ N _____ W.
MAXIMUM SUSTAINED WINDS _____ KT WITH GUSTS TO _____ KT.
RADIUS OF 50 KT WINDS _____ NE _____ SE _____ SW _____ NW.
RADIUS OF 34 KT WINDS _____ NE _____ SE _____ SW _____ NW.
FORECAST VALID _____ Z _____ N _____ W.
MAXIMUM SUSTAINED WINDS _____ KT WITH GUSTS TO _____ KT.
RADIUS OF 50 KT WINDS _____ NE _____ SE _____ SW _____ NW.
RADIUS OF 34 KT WINDS _____ NE _____ SE _____ SW _____ NW.

AVIATION ADVISORY ENDS HERE

STORM-TIDE OF

HEAVY PRECIPITATION

REQUEST FOR 3-HOURLY SHIP REPORTS

SUBTROPICAL STORM AND MARINE ADVISORIES END HERE

EXTENDED OUTLOOK FOR INTRAGOVERNMENTAL USE ONLY
OUTLOOK VALID _____ Z _____ N _____ W.
MAXIMUM SUSTAINED WINDS _____ KT WITH GUSTS TO _____ KT.
RADIUS OF 50 KT WINDS _____ NE _____ SE _____ SW _____ NW.
OUTLOOK VALID _____ Z _____ N _____ W.
MAXIMUM SUSTAINED WINDS _____ KT WITH GUSTS TO _____ KT.
RADIUS OF 50 KT WINDS _____ NE _____ SE _____ SW _____ NW.

NEXT ADVISORY AT _____ Z | FORECASTER

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CHAPTER 5

AIRCRAFT RECONNAISSANCE

1. General. All Department of Commerce (DOC) tropical and subtropical cyclone aircraft reconnaissance needs will be requested and provided in accordance with the procedures of this chapter. As outlined in the USAF/NOAA Memorandum of Understanding (MOU), March 16, 1976, DOC has identified a requirement for, and DOD maintains aircraft to support, up to five reconnaissance aircraft sorties per day. Requirements exceeding five sorties will be accomplished on a "resources permitting" basis. In times of national emergency or war, some or all DOD reconnaissance resources may not be available to fulfill DOC needs.

2. Responsibilities.

a. DOD is responsible for:

(1) Providing operational aircraft for vortex fixes/data, synoptic tracks and investigative flights in response to DOC needs.

(2) Developing operational procedures to deploy data buoys to satisfy DOC needs. For 1985, DOC requests 4 buoys be dropped on a resource permitting basis, into a given storm.

b. DOC is responsible for aircraft operations which may be requested to:

(1) Provide augmentation to the U.S. Air Force (USAF) for operational aircraft reconnaissance with high-density/accuracy data when storms are within 24 hours of landfall of the continental United States.

(2) Provide augmentation capabilities for USAF aircraft reconnaissance when DOC needs exceed the capabilities of DOD resources.

(3) Assume responsibility for hurricane reconnaissance over foreign airspace that may be restricted for military operations.

(4) Conduct research flights which assume an operational responsibility to the hurricane centers.

3. Control of Aircraft. Operational control of aircraft flying tropical or subtropical cyclone reconnaissance will remain with the operating agencies of DOD or DOC as appropriate.

4. Reconnaissance Requirements.

a. Meteorological Parameter Requirements. Data needs in priority order are:

(1) Geographical position of vortex center (vortex fix); surface center if known.

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(2) Center sea-level pressure (by dropsonde or extrapolation from within 1,500 feet of sea surface).

(3) Minimum 700-millibar height (if available).

(4) Wind profile data (surface and flight level).

(5) Temperature (flight level).

(6) Sea-surface temperature.

(7) Dewpoint temperature (flight level).

b. Required Meteorological Reconnaissance Data, Ranges and Accuracies. Required reconnaissance data accuracies are as follows:

(1) Geographic position:

(a) Data position (aircraft) - within 3 n.mi.
(b) Storm surface center (wind/pressure) - within 6 n.mi.
(c) Flight level storm center (wind/pressure) - within 6 n.mi.

(2) Wind direction:

(a) Surface - within 10 degrees.
(b) Flight level (winds greater than 20 kts.) - within 5 degrees.

(3) Wind speed:

(a) Surface - within 10 kts.
(b) Flight level - within 4 kts.

(4) Pressure Height:

(a) Surface - within 2 mb.
(b) Flight level - within 2 decameters above 500 mb, within 10 meters at or below 500 mb.

(5) Temperature:

(a) Sea surface - within $1^{\circ}C$.
(b) Flight level - within $1^{\circ}C$.

(6) Dew point:

(a) Range from $-20^{\circ}C$ to $+40^{\circ}C$ - within $1^{\circ}C$.
(b) Colder than $-20^{\circ}C$ - within $3^{\circ}C$.

(7) Absolute altitude - within 10 m.

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(8) Vertical sounding:

(a) Pressure - within 2 mb.

(b) Temperature - within $1^{o}c$.

(c) Dew point: Range $-20^{o}C$ to $+40^{o}C$ - within $1^{o}C$.
Colder than $-20^{o}C$ - within $3^{o}C$.

(d) Wind direction - within 10^{o}.

(e) Wind speed - within 5 kts.

NOTE: Present weather reconnaissance capabilities do not completely satisfy these requirements; data will be collected as close to stated requirements as possible.

c. Required Frequency and Content of Observations.

(1) Automated Systems:

(a) Time, latitude, longitude, flight level - pressure altitude, radar altitude, D value, wind, temperature, dewpoint, height of standard pressure surface - every minute. Observations transmitted each one-half hour.

(b) Standard RECCO and Vortex observations as required.

(2) Standard (non-automated systems):

(a) Horizontal observations - RECCO Code Section 1 or Section 3 plus 4ddff and 9ViTwTwTw (4 and 9 groups if applicable) every 15 minutes enroute to and from storm within 15^{o} from tasked coordinates (over water). 500 mb data preferred. RECCO obs transmitted hourly enroute to and from storm. Standard RECCO encoding and transmission IAW AWSR 105-25 outside of 15^{o} from tasked coordinates. Horizontal observation data collection frequency, format, and transmission as specified (NHOP flight patterns) within tasked area.

(b) Vertical observations - Frequency enroute to and from tasked coordinates IAW AWSR 105-25 unless otherwise specified. Frequency as specified (NHOP flight patterns) within tasked areas. Format for all vertical observations is WMO TEMP DROP Code.

(c) Vortex and Supplementary Vortex observations collected, encoded, and transmitted IAW NHOP pattern requirements. (See Chapter 5, Appendix B, Forms 3 and 4, for data format.)

NOTE: Present weather reconnaissance capabilities are marginal in satisfying these requirements; data will be collected as close to stated requirements as possible. While the crews will attempt to meet customer requirements, it is understood that observations will not be considered unsatisfactory as long as they are accomplished every 30 minutes.

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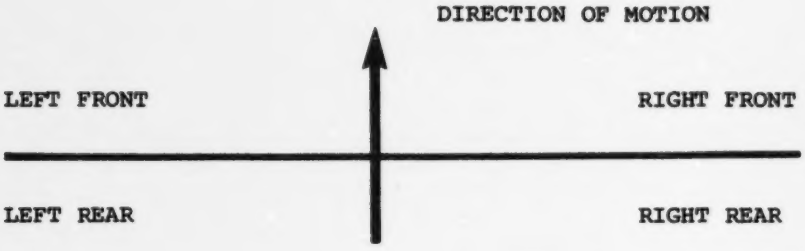
d. Standard Flight Patterns. Operational hurricane reconnaissance flights will fly designated flight patterns (Appendix A of this chapter) that use a quadrant system based upon the predicted direction of motion of the cyclone center. (See following diagram.) A tasked pattern may be adjusted by the flight meteorologist to best fulfill data requirements within operational capabilities of the aircraft or agency concerned.



e. High-Density Accuracy Requirements. DOC requires rapid acquisition and transmission of tropical cyclone data (especially within the last 24 hour period prior to landfall). Since only a limited number of aircraft currently have a high-density/high accuracy (HD/HA) capability, DOC reconnaissance requests should specify which tropical cyclone reconnaissance sorties should utilize HD/HA aircraft. DOD HD/HA aircraft will be provided on a "resources permitting" basis only.

f. High Level Profile Data Requirements. When required, NHC will request mid-tropospheric reconnaissance data on the periphery of systems approaching the United States. NHC will provide a specific track profile, including control point and control time, to CARCAH for coordination with the reconnaissance units.

5. Reconnaissance Planning and Flight Notification.

a. DOC Requests for Aircraft Reconnaissance Data.

(1) NHC will coordinate with Eastern Pacific Hurricane Center (EPHC) and Central Pacific Hurricane Center (CPHC) to determine a list of the total DOC requirements for data on tropical and subtropical cyclones or disturbances for the next 24-hour period (0500Z - 0500Z) and an outlook for the succeeding 24-hour period. This coordinated request will be provided to CARCAH as soon as possible, but not later than (NLT) 1630Z each day (in the format of Form 1, Appendix B). Amendments will be provided as required.

(2) From the above coordinated DOC request, CARCAH will publish the Tropical Cyclone Plan of the Day (TCPOD). When DOC reconnaissance needs exceed DOD and DOC resources, CARCAH will coordinate with NHC to establish priorities of requirements.

(3) The following reconnaissance requests can be anticipated for a forecast or actual storm location:

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(a) Atlantic, Gulf of Mexico, Caribbean, Eastern and Central Pacific - up to four 6-hourly fixes per day when a storm is within 500 nautical miles of landfall west of 55°W and north of 8°N, and up to eight 3-hourly fixes per day when a storm is forecast to be within 300 nautical miles of the U.S. coast, Hawaiian Islands, Puerto Rico, Virgin Islands, DOD installations, and other DOD assets when specified.

(b) Investigative flights may be requested as required for disturbances in areas defined in paragraphs (a) and (b) above (i.e., one or two flights per day dependent upon proximity of landfall and upon known or suspected stage of development).

(c) Exceptions may be made when additional reconnaissance is essential to carry out warning responsibilities.

b. DOD Aircraft Reconnaissance Responsiveness.

(1) Notification of requirements must precede take-off time by at least 16 hours plus en route time to the area of concern.

(2) The "Succeeding Day Outlook" portion of the TCPOD provides advance notification of requirements and authorizes units to preposition aircraft to forward operating locations. For missions requiring prepositioning, the "Succeeding Day Outlook" may not provide adequate advance notification. In these situations an "Additional Day Outlook" may be included in the TCPOD to authorize units to preposition aircraft.

(3) When circumstances preclude the appropriate notification lead time, the requirement will be levied as "resources permitting". When a "resources permitting" requirement is levied in an amendment, NHC will indicate the priority of all existing or remaining requirements.

(4) If a storm develops unexpectedly and could cause a serious threat to lives and property within a shorter time frame than provided for in the paragraphs above, CARCAH will contact the reconnaissance units, or higher headquarters as appropriate, and request assistance in implementing emergency procedures not covered in this plan. NHC, EPHC and CPHC Directors have authority to declare an emergency.

c. Reconnaissance Tropical Cyclone Plan of the Day (TCPOD).

(1) Preparation. CARCAH will prepare the TCPOD (Appendix B, Form 2) daily during the period from 1 June through 30 November and at other times during the year as required.

(a) CARCAH will coordinate the TCPOD with NHC, 815th WRS, 53rd WRS, and OAO before publication.

(b) TCPOD will list all DOC and DOD required tropical/sub-tropical reconnaissance operational missions. The remarks section of the TCPOD will include appropriate comments whenever research and operational flights overlap.

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(c) DOD-required tropical or subtropical cyclone reconnaissance missions in the Atlantic or the Pacific west to 180° will be identified in the TCPOD as USN or USAF requirements.

(d) Amendments to the TCPOD will be published only when requirements change. When amended, the impact on each listed flight will be identified (i.e., no change, change added, or cancel).

(2) Dissemination. The TCPOD will be made available to appropriate agencies that provide support or control reconnaissance aircraft or are a part of the cyclone warning service. The TCPOD will be disseminated by 1800Z each day. Amendments will be disseminated as required.

d. Air Traffic Control (ATC) Clearances.

(1) Air Traffic Control Agencies will provide air traffic control separation between all aircraft operating on storm missions and between storm aircraft and nonparticipating aircraft operating on Instrument Flight Rules (IFR) within controlled airspace. Mission commanders are reminded that nonparticipating aircraft may be operating near storm areas; thus, adherence to ATC clearances is mandatory for safety purposes. CARCAH will indicate in the POD if clearance into warning areas is required.

(2) When storm aircraft cannot maintain assigned altitudes due to turbulence, ATC should be advised. Normal vertical separation of 1,000 feet at FL 290 and below and 2,000 feet above FL 290 will be provided by ATC to aircraft operating in the storm area. Unless otherwise coordinated with ATC, the altitudes between storm-mission aircraft may be used by ATC for nonparticipating aircraft. Any procedure desired by storm-mission commanders which is outside these parameters must be coordinated with the appropriate ATC facility.

(3) Dropsonde releases will be coordinated with the appropriate Air Route Traffic Control Center (ARTCC) and participating aircraft if within controlled airspace, and with participating aircraft only, if outside controlled airspace. Contact between participating aircraft will be made using the frequencies listed in Chapter 5, Appendix C, paragraph 3.

6. Reconnaissance Effectiveness Criteria.

a. General. Specified reconnaissance times are established to allow sufficient time for the forecaster to analyze the data before issuing an advisory. Every effort should be made to obtain data at scheduled times. The following criteria will be used to assess reconnaissance mission effectiveness:

(1) ON-TIME - Fix is made not earlier than 1 hour before nor later than 1/2 hour after scheduled fix time. Investigative aircraft are within 250 nautical miles of the specified coordinates by the scheduled time.

(2) EARLY - Fix is made from 1 hour before scheduled fix time to one-half of the time interval to the preceding scheduled fix (not to exceed 3 hours).

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(3) LATE - Fix is made within the interval from 1/2 hour after scheduled fix time to one-half of the time interval to the succeeding scheduled fix (not to exceed 3 hours). Investigative aircraft are within 250 nautical miles of specified coordinates no later than 2 hours after scheduled time.

(4) MISSED - Data are not obtained within the parameters specified for on-time, early, or late.

(5) EXCEPTIONS - Appropriate credit will be given when the aircraft arrives in the requested area but is unable to locate a center due to storm dissipation or rapid movement.

b. NHC, CPHC, or EPHC will provide CARCAH a written assessment of the reconnaissance mission anytime its timeliness or quality is outstanding or substandard (see Appendix B, Form 5). Requirements levied as "resources permitting" will not be assessed for timeliness, but may be assessed for quality of data gathered.

c. CARCAH will maintain monthly and seasonal reconnaissance summaries detailing missions actually flown to satisfy NHC levied requirements.

7. Aerial Reconnaissance Weather Encoding, Reporting and Coordination.

a. Vortex Data. The detailed Vortex Data Message (Form 3, Appendix B) will be prepared with all observed vortex fix information for all scheduled fixes. For intermediate fixes, either an abbreviated or detailed Vortex Data Message may be transmitted, depending upon availability of information and forecaster requirements.

b. Center Fix Data. All radar fix reports and other type aircraft center fixes will be made in plain text and appended to the RECCO observation also taken at fix time. Remarks stating the degree of confidence should be included for radar fixes in the same manner as in Chapter 7, paragraph 2.b.

c. Supplementary Vortex Data. Penetration and collection of supplementary vortex data on operational flight patterns A will normally start at 700 millibars at a radius of approximately 105 nautical miles from the center as determined by the flight meteorologist. The supplementary vortex data required are as shown in Appendix B, Form 4. Note: Present weather reconnaissance equipment is inadequate to provide full data for 15NM supplemental vortex data; data will be collected as close to stated requirements as possible and within the capabilities of the flight crew.

d. Mission Coordination. Mission coordination for all missions will be accomplished through CARCAH. Meteorological discussions for central and eastern Pacific missions may be accomplished directly with the appropriate hurricane center; however, any changes to tasking requirements will be accomplished through CARCAH.

e. Post-flight Debriefing. Unless otherwise directed, the flight meteorologist will provide either an airborne or post-flight debriefing to the appropriate hurricane center to ensure all observations were received and understood.

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f. Mission Identifier. Each reconnaissance report will include the mission identifier as the opening text of the message. Regular weather and hurricane reconnaissance messages will include the five-digit agency/aircraft indicator followed by the CARCAH-assigned mission-system indicator. Elements of the mission identifier are:

Agency - Aircraft Indicator -- Mission System Indicator

Agency - Aircraft Number	No. of missions this system	Depression No. or XX if not a depression or greater	Storm name or words
AF plus last 3 digits of tail number	(2 digits)	(2 digits)	CYCLONE or INVEST
NOAA plus last digit of aircraft registration number			

EXAMPLES:

AF985	01XX	INVEST	(Air Force aircraft 985 on the first mission to investigate a suspect area.)
AF987	0503	CYCLONE	(Air Force aircraft 987 on the fifth mission on depression No. 3. Invest or fix as specified in TCPOD.)
NOAA2	0701	AGNES	(NOAA aircraft 42RF on the seventh mission to fix depression No. 1, which has acquired the name AGNES.)

g. Observation Numbering and Content.

(1) The first weather observation will have appended as remarks the ICAO four-letter departure station identifier, time of departure, and estimated time of arrival (ETA) at the coordinates or storm.

EXAMPLE:

AF966 0308 EMMY OB 01
97779 TEXT TEXT...DPTD KBIX AT 10/2100Z ETA 31.5N 75.0W AT 11/0015Z

(2) All observations (RECCO, Vortex, Supplemental, and Dropsonde) from the first to the last will be numbered sequentially. When an aircraft is diverted from standard reconnaissance to fulfill NHC requirements, the next observation from the diverted aircraft will be labeled OB 01, will use the CARCAH assigned mission identifier, and will include time of diversion and ETA to coodinates of interest. If diverted from an NHC mission to fulfill new NHC requirements or if the aircraft is programmed to satisfy separate NHC system requirements, the same rule applies except that last report remarks will be added to the terminated mission.

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EXAMPLE:

AF968 01XX INVEST OB 01
97779 TEXT TEXT...DPTD FOXTROT TRACK AT 05/1438Z ETA 18N 85W AT 05/1630Z

(3) If a CARCAH assigned mission identifier is changed inflight as a result of system intensity changes, observation numbers will continue sequentially and appropriate remarks made.

EXAMPLE:

AF987 0308 EMMY OB 06
97779 TEXT TEXT...OBS 01 THRU 05 XMTD AS AF987 0308 CYCLONE

(4) Appended to the final weather observation will be a last report remark, which will include destination, ETA, number of observations, and monitor(s) that copied the observations.

EXAMPLE:

AF553 0308 EMMY OB 16
XXAA TEXT TEXT...LAST REPORT ETA KBIX 11/0910Z OBS 01 THRU 10 and 12 THRU 16 KMIA OB 11 KMHR

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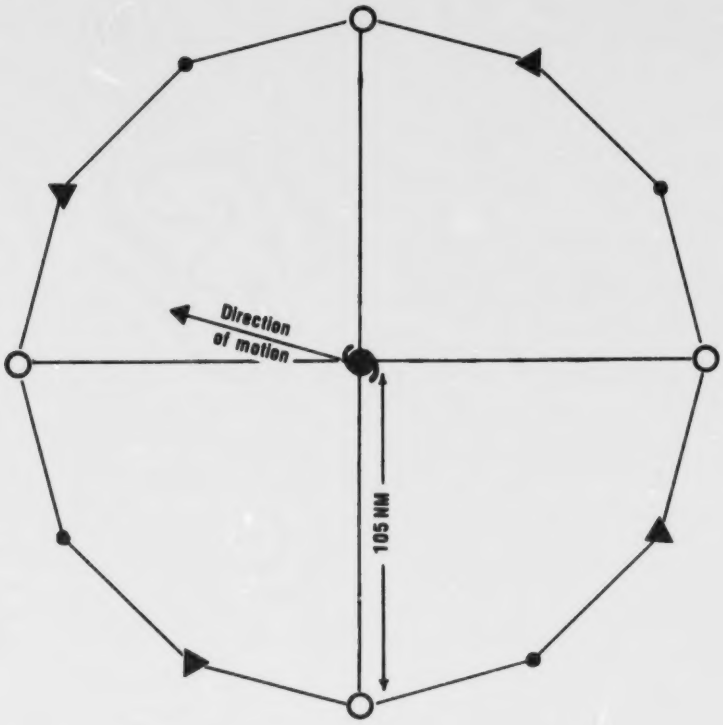
CHAPTER 5
APPENDIX A
ATTACHMENT 1

OPERATIONAL FLIGHT PATTERN "A"

Provides vortex and peripheral data on tropical and subtropical cyclones including two 6-hourly and intermediate fixes.

DATA REQUIREMENTS



OBSERVATION DETAILS

1. Flight level 700 millibars, but may be low-level if requested. Low-level missions are normally conducted at 1500 feet, but may be adjusted as dictated by data requirements, meteorological conditions, or flying safety factors. During day or night operations, when safety conditions dictate, an 850 millibar or higher altitude may be flown.

2. RECCO (Section 1 plus 4ddff and 9ViTwTwTw) is required for each transit of a triangle position. Transmit immediately. RECCO (Section 3 plus 4ddff and 9ViTwTwTw) is required for each transit of a darkened circle position (appended to next RECCO Section observation). Groups with indicator 4 or 9 are included in observations only when surface winds are discernible or flight is at low level. Open circle positions indicate the beginning or ending of supplementary vortex data inbound or outbound radials.

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3. Supplementary Vortex data are required for each radial flown inbound or outbound. Transmit data to the appropriate monitor at the end of each pair of inbound/outbound radial legs flown.

4. On each transit of the center a fix will be made and a Vortex Data Message completed. If it is a scheduled fix, the Detailed Vortex Data Message will be completed using data gathered since the previous fix and will be transmitted immediately. If it is an intermediate (nonscheduled) fix, an Abbreviated Vortex Data Message using data gathered since the previous fix may be prepared in lieu of the detailed message and transmitted immediately. Center dropsonde data will also be provided for scheduled fixes made at 700 millibars or above.

5. Dropsonde data, when required in the periphery of the storm, will be taken at the triangular positions indicated. The requirement for these data will be determined on a case-by-case basis and coordinated through the POD.

6. Entry and exit courses should be one of the cardinal directions (see recommended pattern "A" execution, Attachment No. 1A). These courses should be maintained within 20^{o}.

7. Lack of automated data collection on DOD aircraft may preclude complete and timely satisfaction of all requirements.

Weather Instrumented USAF WC-130 Flown
for Hurricane Reconnaissance

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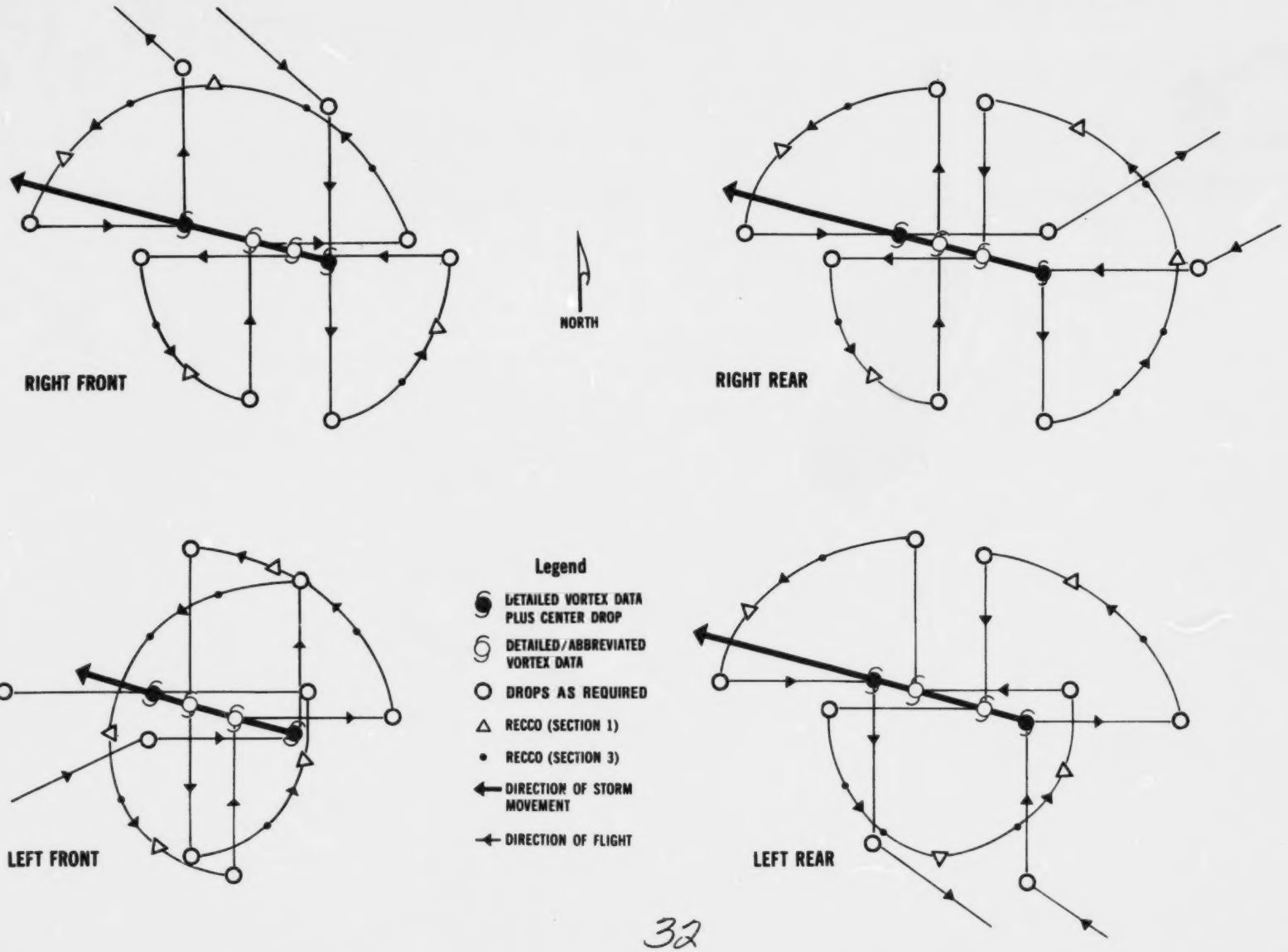
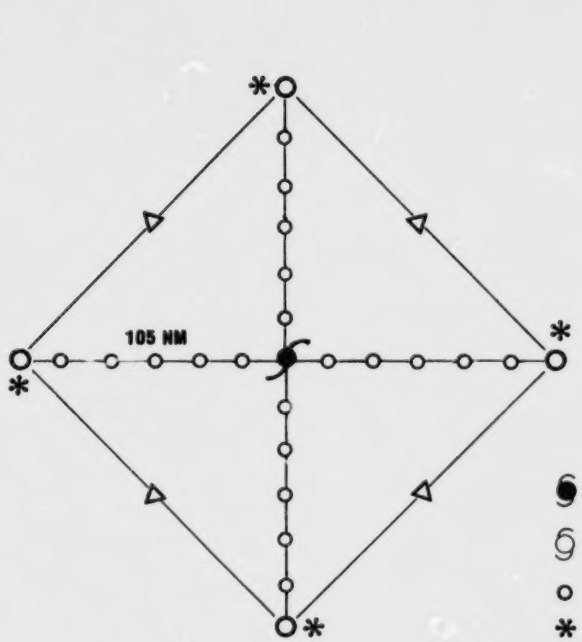
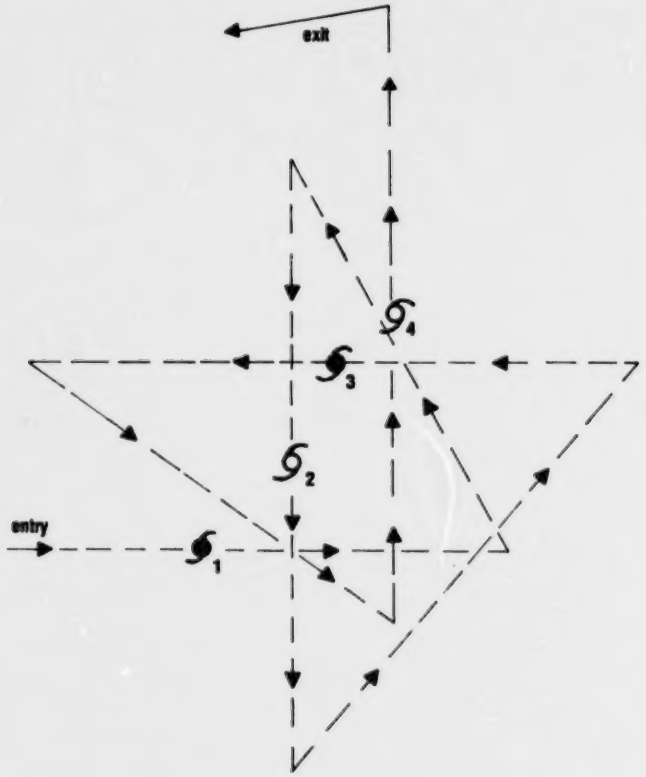
RECOMMENDED PATTERN "A" EXCUTION



RECOMMENDED PATTERN "A" (MODIFIED) EXECUTION





Legend

- DETAILED VORTEX DATA PLUS CENTER DROP
- DETAILED/ABBREVIATED VORTEX DATA
- SUPPLEMENTARY VORTEX DATA
- DROPS AS REQUIRED
- RECCO (SECTION 1)
- RECCO (SECTION 3)
- DIRECTION OF STORM MOVEMENT
- DIRECTION OF FLIGHT

Pattern may be entered on any leg

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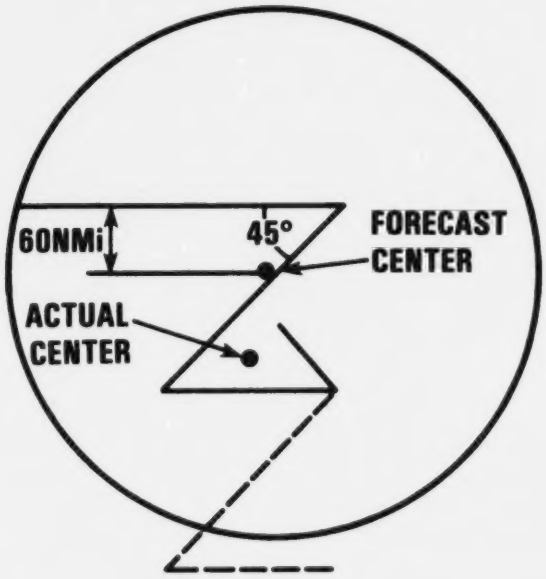
CHAPTER 5
APPENDIX A
ATTACHMENT 2

OPERATIONAL FLIGHT PATTERN DELTA

Provides a suggested approach to the investigation of a disturbance to ascertain the existence or nonexistence of a closed circulation, supply RECCO observations in required areas, and locate the vortex center. This pattern is normally not tasked when a closed circulation has been identified and scheduled fixes are required.



OBSERVATION DETAILS

1. Flight level 1500 feet, but may be adjusted as dictated by data requirements, meteorological conditions, or flying safety factors. During day or night operations when flying safety conditions dictate, an 850 milibar or higher altitude may be flown.

2. RECCO (Section 1 plus 4ddff and 9ViTwTwTw) required every 30 minutes. RECCO (Section 3 plus 4ddff and 9ViTwTwTw) required approximately every 15 minutes. Section 3 data are appended to next RECCO Section 1 observation. The 4 or 9 Group will not be reported if data are not available.

3. Detailed Vortex Data Message required if vortex fix is made.

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DISCUSSION:

The Delta pattern is designed to provide the flexibility required in the investigation of a disturbance as follows:

1. The pattern is converted west-east to a mirror image if entry is to be made from the east.

2. The length of the legs is to be adjusted during the pattern to coincide with cyclonic circulation wind shifts, i.e., turn points are selected by the flight meteorologist after observing appropriate sustained wind shifts.

3. If observed data indicate that the aircraft is on the southern side of the circulation, the pattern is converted south-north to a mirror image pattern to enable investigation in the proper areas.

4. If data indicate to the flight meteorologist that the aircraft is far north of any existing circulation, the pattern is extended (as shown by dashed lines) to allow further investigation.

5. If the location of the center becomes obvious, the pattern may be broken off to accomplish a vortex fix. Forecast agencies may request changes in the pattern as dictated by their data requirements.

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CHAPTER 5
APPENDIX B
FORM 1

NHOP COORDINATED REQUEST FOR AIRCRAFT RECONNAISSANCE

___ Original
___ Amendment
(Check One)

I. ATLANTIC REQUIREMENTS

STORM NAME DEPRESSION # SUSPECT AREA	FIX OR ON STATION TIME	COORDI-NATES	FLIGHT PATTERN	FCST MVMT	HIGH DENS ACCY REQT	NHC PRI-ORITY

SUCCEEDING DAY OUTLOOK _____

REMARKS _____

II. EASTERN AND CENTRAL PACIFIC REQUIREMENTS

STORM NAME DEPRESSION # SUSPECT AREA	FIX OR ON STATION TIME	COORDI-NATES	FLIGHT PATTERN	FCST MVMT	HIGH DENS ACCY REQT	NHC PRI-ORITY

SUCCEEDING DAY OUTLOOK _____

REMARKS _____

III. DISTRIBUTION

A. TO CARCAH BY 1630Z OR AMEND AT ANY TIME

B. DATE _____ TIME _____ FCSTR INIT _____

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CHAPTER 5
APPENDIX B
FORM 2

TROPICAL CYCLONE PLAN OF THE DAY FORMAT
--ATLANTIC, EASTERN, AND CENTRAL PACIFIC OCEANS--

FM OL-G HQ AWS CORAL GABLES FL/CARCAH

TO (MAC-APPROVED ADDRESSEES)/(NOAA-APPROVED ADDRESSEES)

SUBJECT TROPICAL CYCLONE
RECON POD FROM _____Z (MONTH) (YEAR) TO _____Z (MONTH) (YEAR) FOLLOWS

I. ATLANTIC

1. (STORM NAME, DEPRESSION, SUSPECT AREA) or (NEGATIVE RECON REQUIREMENTS)

FLIGHT ONE (NHC PRIORITY, if applicable)

A. _____Z FIX TIMES/ON STATION TIMES
(Resources Permitting if applicable)
_____Z

B. _____ MISSION IDENTIFIER

C. _____Z ETD

D. _____ DEPARTURE STATION

E. _____ FORECAST POSITION/STORM NAME

F. _____ DESTINATION STATION

G. _____ FLIGHT PATTERN

H. _____ FORECAST MOVEMENT

I. _____ REMARKS

FLIGHT TWO (if applicable, same as FLIGHT ONE)

2. (SECOND SYSTEM, if applicable, same as in 1. above)

3. OUTLOOK FOR SUCCEEDING DAY (NHC PRIORITY, if applicable)

A. POSSIBLE __(Unit)__ ON STATION REQUIREMENT NEAR __(Location)__
AT __(Time)__ Z.

II. EASTERN AND CENTRAL PACIFIC (Same as in ATLANTIC)

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VORTEX DATA MESSAGE

MANOP HEADING (PRECEDENCE IMMEDIATE)				
MISSION IDENTIFIER AND OBSERVATION NUMBER				
(ABBREVIATED) (DETAILED) VORTEX DATA MESSAGE				
A			Z	DATE AND TIME OF FIX
B	DEG	MIN	N S	LATITUDE OF VORTEX FIX
	DEG	MIN	E W	LONGITUDE OF VORTEX FIX
C	MB		M	MINIMUM HEIGHT AT STANDARD LEVEL
D			KT	ESTIMATE OF MAXIMUM SURFACE WIND OBSERVED
E	DEG		NM	BEARING AND RANGE FROM CENTER OF MAXIMUM SURFACE WIND
F	DEG		KT	MAXIMUM FLIGHT LEVEL WIND NEAR CENTER
G	DEG		NM	BEARING AND RANGE FROM CENTER OF MAXIMUM FLIGHT LEVEL WIND
H			MB	MINIMUM SEA LEVEL PRESSURE COMPUTED FROM DROPSONDE OR EXTRAPOLATED FROM WITHIN 1500 FT OF SEA SURFACE
I	C/		M	MAX FLT LVL TEMP/PRESSURE ALT OUTSIDE EYE
J	C/		M	MAX FLT LVL TEMP/PRESSURE ALT INSIDE EYE
K	C/		C	DEWPOINT TEMP/SEA SURFACE TEMP INSIDE EYE
L				EYE CHARACTER: Closed wall, poorly defined, open SW, etc.
M				EYE SHAPE/ORIENTATION/DIAMETER. Code eye shape as: C – Circular; CO – Concentric; E – Elliptical. Transmit orientation of major axis in tens of degrees, i.e., 01–010 to 190; 17–170 to 350. Transmit diameter in nautical miles. *Examples:* C8–Circular eye 8 miles in diameter. E09/15/5 – Elliptical eye, major axis 090–270, length of major axis 15 NM, length of minor axis 5NM. CO8–14 – Concentric eye, diameter inner eye 8 NM, outer eye 14 NM.
N	DEG	MIN	N S	CONFIRMATION OF FIX: Coordinates and Time
	DEG	MIN	E W	
			Z	
O	/			FIX DETERMINED BY/FIX LEVEL FIX DETERMINED BY: 1 – Penetration; 2 – Radar; 3 – Wind; 4 – Pressure; 5 – Temperature. FIX LEVEL (Indicate surface center if visible; indicate both surface and flight level centers only when same): 0 – Surface, 1 – 1500 ft; 8 – 850 mb; 7 – 700 mb; 5 – 500 mb; 4 – 400 mb; 3 – 300 mb; 2 – 200 mb; 9 – Other.
P	/		NM	NAVIGATION FIX ACCURACY/METEOROLOGICAL ACCURACY
Q				REMARKS

INSTRUCTIONS: Items A through G (and H when extrapolated) are transmitted from the aircraft immediately following the fix. The remainder of the message is transmitted as soon as available for scheduled fixes and at the ARWO's discretion for unscheduled (intermediate) fixes.

37085

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SUPPLEMENTARY VORTEX DATA MESSAGE

MANOP HEADING *(completed by monitors only)*

UR ——— ——— 12 ——— ——— ——— ——— ——— ——— ——— ——— ——— ———

MISSION IDENTIFIER AND OBSERVATION NUMBER *(completed by flight meteorologist and monitor)*

AF——— ——— ———

SUPPLEMENTARY VORTEX DATA MESSAGE

($L_o L_o L_o$)	($L_o L_o L_o L_o$)	(jHHH)	($TTT_d T_d$)	(ddfff)
01	1	1	1	
02	2	2	2	
03	3	3	3	
04	4	4	4	
05	5	5	5	
06	6	6	6	
07	7	7	7	
($L_o L_o L_o$) MF	($L_o L_o L_o L_o$) M	(fff) MF		

OBS 01 AT: ——— Z | OBS ——— AT ——— Z | OBS 01 SFC WND:

($L_o L_o L_o$)	($L_o L_o L_o L_o$)	(jHHH)	($TTT_d T_d$)	(ddfff)
01	1	1	1	
02	2	2	2	
03	3	3	3	
04	4	4	4	
05	5	5	5	
06	6	6	6	
07	7	7	7	
($L_o L_o L_o$) MF	($L_o L_o L_o L_o$) M	(fff) MF		

OBS 01 AT: ——— Z | OBS ——— AT ——— Z | OBS 07 SFC WND:

REMARKS *(end of message)*

PREPARED BY: | TRANSMISSION TIME:

LEGEND

01 INDICATOR FOR DATA COLLECTED APPROXIMATELY 105 NM FROM STORM CENTER (INBOUND) OR APPROXIMATELY 15 NM FROM CENTER (OUTBOUND)

OTHER INDICATORS (02/2, 03/3....) FOR DATA AT APPROXIMATELY 15 NM INTERVALS INBOUND OR OUTBOUND FROM STORM CENTER. INDICATORS MAY BE EXPANDED BEYOND 07 (08, 09....) AS NECESSARY AT APPROXIMATELY 15 NM INTERVALS.

MF = INDICATOR FOR MAXIMUM FLIGHT LEVEL WIND OBSERVED

fff = SPEED OF WIND IN KNOTS

dd = TRUE DIRECTION OF FLIGHT LEVEL WIND SPEED IN TENS OF DEGREES

$TTT_d T_d$ = TEMP/DEWPOINT IN DEGREES CELSIUS: ADD 50 FOR NEGATIVE VALUES

jHHH = PRESSURE HEIGHT DATA IN RECCO FORMAT

$L_o L_o L_o$ = LATITUDE IN DEGREES/TENTHS

$L_o L_o L_o L_o$ = LONGITUDE IN DEGREES/TENTHS

/ = DATA UNKNOWN/UNOBTAINABLE

SAMPLE MESSAGE

URNT 12 KMIA 241703
AF 966 0411 FREDERIC OB 14
SUPPLEMENTARY VORTEX DATA MESSAGE

01178	10899	13107	10908	36027
02177	20895	23100	20908	35042
03178	30891	33092	30807	36052
04177	40887	43088	40907	35070
05178	50883	53070	50908	36088
06178	60880	63000	61010	35108
07178	70877	73882	71211	35120

MF178 M0877 MF120
OBS 01 AT 1530Z OBS 07 AT 1600Z
OBS 01 SFC WND 36028

01177	10872	13000	11010	18120
02178	20868	23070	21009	17098
03178	30862	23088	30909	18080
04177	40858	43093	40906	17050
05177	50854	53102	50908	17048
06178	60850	63108	60905	18031
07177	70844	73114	70902	18025

MF177 M0872 MF120
OBS 01 AT 1630Z OBS 07 AT 1700Z
OBS 07 SFC WIND 16025
REMARKS HEAVY RAIN OUTBOUND

AWS FORM APR 84 82a PREVIOUS EDITION IS OBSOLETE

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CHAPTER 5
APPENDIX B
FORM 5

MISSION EVALUATION FORM

DATE: _____

TO: OL-G, HQ AWS/CARCAH

FROM: _____(Director, NHC, CPHC, EPHC)_____

SUBJECT: Mission _____ Evaluation
(Mission Identifier)

PUBLISHED REQUIREMENTS:

Permission Coordinates (As Updated Prior to TKO) _____N _____W

Flight Pattern _____

Mission Requirements Times _____

RECONNAISSANCE MISSION PERFORMANCE:

Flight Flown: ____Completely ____Partially ____Other

Horizontal Data Coverage: ____Complete ____Timely ____Accurate
____Incomplete ____Untimely ____Inaccurate

Vertical Data Coverage: ____Complete ____Timely ____Accurate
____Incomplete ____Untimely ____Inaccurate

Requirements Accomplished: ____On Time ____Early ____Late
____Missed

Remarks: _____

_____

OVERALL MISSION EVALUATION:

	Outstanding	Satisfactory	Unsatisfactory
Equipment:	_____	_____	_____
Accuracy:	_____	_____	_____
Timeliness:	_____	_____	_____
Procedures:	_____	_____	_____
Completeness:	_____	_____	_____

Remarks: _____

_____

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DATE					ORGANIZATION					MISSION IDENTIFIER							TYPE AIRCRAFT				CALL SIGN
OBSERVATION NUMBER	9	RECCO INDICATOR GROUP SPECIFYING TYPE OF OBSERVATION *Table 1*	G	TIME OF OBSERVATION *(Hours and Minutes)* *(GMT)*	Y	DAY OF WEEK *SUN=1*	L_o	LONGITUDE DEGREES AND TENTHS *(Note 4)*	h_o	PRESSURE ALTITUDE OF AIRCRAFT REPORTED TO THE NEAREST DECAMETER	d	WIND DIRECTION AT FLIGHT LEVEL *(Tens of deg. true.)*	T	TEMPERATURE WHOLE °C *(Note 6)*	/	INDICATOR	1	INDICATOR	C	CLOUD TYPE *Table 11*	C	CLOUD TYPE *Table 11*	C	CLOUD TYPE *Table 11*
	X		G		Q	OCTANT *Table 3*	L_o		h_o		d		T		J	INDEX TO HHH *Table 9*	h_n	NR OF CLOUD LAYERS *(Note 9)*	h_s	ALTITUDE OF BASE *Table 12*	h_s	ALTITUDE OF BASE *Table 12*	h_s	ALTITUDE OF BASE *Table 12*
	X		θ		L_o	LATITUDE DEGREES AND TENTHS	L_o		h_o		f	WIND SPEED AT FLIGHT LEVEL *(Knots)*	T_d	DEW POINT WHOLE °C *(Note 6)*	H	GEOPOTENTIAL HEIGHT/D-VALUE OR SLP PER INDEX j *(Note 8)*	N_s	AMOUNT OF CLOUDS *(Note 9)* *Table 10*	h_s	ALTITUDE OF BASE *Table 12*	H_t	ALTITUDE OF TOP *Table 12*	H_t	ALTITUDE OF TOP *Table 12*
	X		θ		L_o		B	TURBULENCE *Table 4*	d_t	TYPE OF WIND *Table 6*									H_s					
	9		i_d	DEW POINT INDICATOR *Table 2*	L_o		f_c	FLT COND *Table 5 (Note 5)*	d_o	METHOD OF OBTAINING WIND *Table 7*	f		w	PRESENT WEATHER *(Note 7 Table 8)*	H		N_s		H_t		H_t		H_t	
	1		2		3		4		5		6		7		8		9		10		11		12	

REMARKS

METEOROLOGIST										RECCO RECORDING FORM															
1	INDICATOR	C	CLOUD TYPE *Table 11*	C	CLOUD TYPE *Table 11*	C	CLOUD TYPE *Table 11*	4	INDICATOR	6	INDICATOR *(Note 11)*	6	INDICATOR *(Note 11)*	7	INDICATOR	7	INDICATOR	8	INDICATOR	8	INDICATOR	9	INDICATOR	REMARKS
K_n	NR OF CLOUD LAYERS *(Note 9)*	h_s	ALTITUDE OF BASE *Table 12*	h_s	ALTITUDE OF BASE *Table 12*	h_s	ALTITUDE OF BASE *Table 12*	d	DIRECTION OF SFC WIND *(Tens of deg. true)*	W_s	SIGNIFICANT WEA CHANGES *Table 14*	W_s	SIGNIFICANT WEA CHANGES *Table 14*	I_r	RATE OF ICING *Table 17*	h_i	ALT OF BASE OF ICING STRATUM *(Note 12) Table 12*	d_r	BEARING OF ECHO CENTER *(Tens of Deg. True)*	E_w	ECHO WIDTH OR DIAM *Table 19*	V_i	INFLIGHT VISIBILITY *Table 23*	
N_s	AMOUNT OF CLOUDS *(Note 9)* *Table 10*	h_s	ALTITUDE OF BASE *Table 12*	h_s	ALTITUDE OF BASE *Table 12*	h_s	ALTITUDE OF BASE *Table 12*	d	SURFACE WIND SPEED *(Knots)* *(Note10)*	S_o	DISTANCE OF OCCURRENCE OF *We Table 15*	S_s	DISTANCE OF OCCURRENCE OF *We Table 15*	I_t	TYPE OF ICING *Table 18*	h_i		d_r		E_l	LENGTH OF MAJ AXIS *Table 19*	T_w	SEA SURFACE TEMPERATURE DEGREES AND TENTHS	
N_s		H_t	ALTITUDE OF TOP *Table 12*	H_t	ALTITUDE OF TOP *Table 12*	H_t	ALTITUDE OF TOP *Table 12*	f		W_d	DISTANT WEATHER *Table 16*	W_d	DISTANT WEATHER *Table 16*	S_b	DISTANCE TO BEGINNING OF ICING *Table 15*	H_i	ALTITUDE OF TOP OF ICING STRATUM *(Note 12) Table 12*	S_r	DISTANCE TO ECHO CEN *Table 19*	C_e	CHARACTER OF ECHO *Table 21*	T_w		
N_s		H_t		H_t		H_t		f		d_w	BEARING OF W_d *Table 13*	d_w	BEARING OF W_d *Table 13*	S_e	DISTANCE TO ENDING OF ICING *Table 15*	H_i		O_e	ORIENTATION OF ELLIPSE *Table 20*	I_e	INTENSITY OF ECHO *Table 22*	T_w		
13		14		15		16		17		18		19		20		21		22		23		24			

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CHAPTER 5
APPENDIX B
FORM 6
NOTES

1. At the time of the observation the aircraft observing platform is considered to be located on the axis of a right vertical cylinder with a radius of 30 nautical miles bounded by the earth's surface and the top of the atmosphere. Present weather, cloud amount and type, turbulence, and other subjective elements are reported as occuring within the cylinder. Flight level winds, temperature, dew point, and geopotential values are sensed or computed and reported as occuring at the center of the observation circle. Radar echoes, significant weather changes, distant weather, and icing are phenomena that may also be observed/reported. Code groups identifying these phenomena may be reported as necessary to adequately describe met conditions observed.

2. The intermediate observation (Section Three) is reported following Section One (or Section Two if appended to Section One) in the order that it was taken.

3. Plain language remarks may be added as appropriate. These remarks follow the last encoded portion of the horizontal or vertical observation and will clearly convey the intended message. Vertical observations will not include meteorological remarks. These remarks must begin with a letter or word– E.G. "FL TEMP" vice "700 MB FL TEMP". The last report plain language remarks are mandatory, i.e., "LAST REPORT. OBS 01 thru 08 to RJTY, OBS 09 and 10 to RPMK".

4. The hundreds digit of longitude is omitted for longitudes from 100° to 180°.

5. Describe conditions along the route of flight actually experienced at flight level by aircraft.

6. TT, T_dT_d. When encoding negative temperatures, 50 is added to the absolute value of the temperature with the hundreds figure, if any, being omitted. A temperature of –52°C is given as 02, the distinction between –52°C and 2°C being made from i_d. Missing unknown temperatures are reported as //. When the dew point is colder than –49.4°C, Code T_dT_d as // and report the actual value as a plain language remark – E.G. DEW POINT –52°C.

7. When two or more types of w co–exist, the type with the higher code figure will be reported. Code Figure 1, 2 and 3 are reported based on the total cloud amount through a given altitude, above or below the aircraft, and when other figures are inappropriate. The summation principle applies only when two or more cloud types share a given altitude.

8. When j is reported as a 9, HHH is encoded as ///.

9. If the number of cloud layers reported exceeds 3, k_n in the first 1–group reports the total number of cloud layers. The second 1–group reports the additional number of layers being reported exclusive of those previously reported. In those cases where a cloud layer(s) is discernible, but a descriptive cloud picture of the observation circle is not possible, use appropriate remarks such as "clouds blo" or As blo" to indicate the presence of lcouds. In such cases, coded entries are not made for group 9. The sequence in which cloud amounts are encoded depends upon type of cloud, cloud base, and vertical extent of the cloud. The cloud with the largest numerical value of cloud type code (C) is reported first, regardless of coverage, base, or vertical extent. Among clouds of the same cloud type code sharing a common base, the cloud of greatest vertical extent is reported first. The summation principle is not used; each layer is treated as though no other clouds were present. The total amount of clouds through one altitude shared by several clouds will not exceed 8 oktas. Only use code figure 0 as a place holder when you can determine that no additional cloud layers exist. In case of undercast, overcast, etc., use code figure 9 as a placeholder.

10. Due to limitations in the ability to distinguish sea state features representative of wind speeds above 130 knots, surface wind speeds in excess of 130 knots will not be encoded. Wind speeds of 100 to 130 knots inclusive will be encoded by deleting the hundreds figure and adding 50 to dd. For wind speeds above 130 knots, dd is reported without adding 50 and ff is encoded as // with a plain language remark added, I.E., –sfc wind above 130 knots.

11. Significant weather changes which have occurred since the last observation along the track are reported for Ws.

12. When aircraft encounters icing in level flight, the height at which the icing occurred will be reported for h_ih_i. The H_iH_i will be reported as //.

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CHAPTER 5
APPENDIX B
FORM 6
CODE TABLES

TABLE 1 XXX

222 Sec One Observation without radar capability
555 Sec Three (Intermediate) observation with or without radar capability
777 Sec One Observation with radar capability

TABLE 2 i_d

0 No dew point capability/acft below 10,000 meters
1 No dew point capability/acft at or above 10,000 meters
2 No dew point capability/acft below 10,000 meters and flight lvl temp −50°C or colder
3 No dew point capability/acft at or above 10,000 meters and flight lvl temp −50°C or colder
4 Dew point capability/acft below 10,000 meters
5 Dew point capability/acft at or above 10,000 meters
6 Dew point capability/acft below 10,000 meters and flight lvl temp −50° C or colder
7 Dew point capability/acft at or above 10,000 meters and flight lvl temp −50°C or colder

TABLE 3 Q

0	0° −90° W	Northern
1	90° W − 180° W	Northern
2	180° − 90° E	Northern
3	90° − 0° E	Northern
4	Not Used	
5	0° − 90° W	Southern
6	90° −180° W	Southern
7	180° − 90° E	Southern
8	90° − 0° E	Southern

TABLE 4 B

0 None
1 Light turbulence
2 Moderate turbulence in clear air, infrequent
3 Moderate turbulence in clear air, frequent
4 Moderate turbulence in cloud, infrequent
5 Moderate turbulence in cloud, frequent
6 Severe turbulence in clear air, infrequent
7 Severe turbulence in clear air, frequent
8 Severe turbulence in cloud, infrequent
9 Severe turbulence in cloud frequent

TABLE 5 f_c

0 In the clear
8 In and out of clouds
9 In clouds all the time (continous IMC)
/ Impossible to determine due to darkness or other cause

TABLE 6 d_t

0 Spot Wind
1 Average Wind
/ No wind reported

TABLE 7 d_o

0 Winds obtained using doppler radar or inertial systems
1 Winds obtained using other navigation equipment and/or techniques
/ Navigator unable to determine wind or wind not compatible

TABLE 8 w

0 Clear
1 Scattered (trace to 4/8 cloud coverage)
2 Broken (5/8 to 7/8 cloud coverage)
3 Overcast/undercast
4 Fog, thick dust or haze
5 Drizzle
6 Rain (continous or intermittent precip − from stratiform clouds)
7 Snow or rain and snow mixed
8 Shower(s) (continous or intermittent precip − from cumuliform clouds)
9 Thunderstorm(s)
/ Unknown for any cause including dark − ness

TABLE 9 j

0 Sea level pressure in whole millibars *(thousands fig if any omitted)*
1 Altitude 200 mb surface in geopotential decameters *(thousands fig if any omitted)*
2 Altitude 850 mb surface in geopotential meters *(thousands fig omitted)*
3 Altitude 700 mb surface in geopotential meters *(thousands fig omitted)*
4 Altitude 500 mb surface in geopotential decameters
5 Altitude 400 mb surface in geopotential decametets
6 Altitude 300 mb surface in geopotential decameters
7 Altitude 250 mb surface in geopotential decameters *(thousands fig if any omitted)*
8 D − Value in geopotential decameters; if negative 500 is added to HHH
9 No absolute altitude available or geopotential data not within ± 30 meters/4 mb accuracy requirements.

TABLE 10 N_s

0 No additional cloud layers (place holder)
1 1 okta or less, but not zero *(1/8 or less sky covered)*
2 2 oktas *(or 2/8 of sky covered)*
3 3 oktas *(or 3/8 sky covered)*
4 4 oktas *(or 4/8 of sky covered)*
5 5 oktas *(or 5/8 of sky covered)*
6 6 oktas *(or 6/8 of sky covered)*
7 7 oktas or more but not 8 oktas
8 8 oktas or sky completely covered
9 Sky obscured (place holder)

TABLE 11 C

0 Cirrus (Ci)
1 Cirrocumulus (Cc)
2 Cirrostratus (Cs)
3 Altocumulus (Ac)
4 Altostratus (As)
5 Nimbostratus (Ns)
6 Stratocumulus (Sc)
7 Stratus (St)
8 Cumulus (Cu)
9 Cumulonimbus (Cb)
/ Cloud type unknown due to darkness or other analogous phenomena

TABLE 12 $h_sh_sH_tH_th_ih_iH_iH_i$

00 Less than 100
01 100 ft
02 200 ft
03 300 ft
etc, etc
49 4,900 ft
50 5,000 ft
51_ 55 Not used
56 6,000 ft
57 7,000 ft
etc, etc
79 29,000ft
80 30,000 ft
81 35,000 ft
82 40,000 ft
etc, etc
89 Greater than 70,000 ft
// Unknown

TABLE 13 d_w

0 No report
1 NE
2 E
3 SE
4 S
5 SW
6 W
7 NW
8 N
9 all directions

TABLE 14 W_s

0 No change
1 Marked wind shift
2 Beginning or ending of marked turbulence
3 Marked temperature change (not with altitude)
4 Precipitation begins or ends
5 Change in cloud forms
6 Fog or ice fog bank begins or ends
7 Warm front
8 Cold front
9 Front, type not specified

TABLE 15 $S_bS_eS_s$

0 No report
1 Previous position
2 Present position
3 30 nautical miles
4 60 nautical miles
5 90 nautical miles
6 120 nautical miles
7 150 nautical miles
8 180 nautical miles
9 More than 180 nautical miles
/ Unknown (not used for S_s)

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TABLE 16 w_d

0 No report
1 Signs of a tropical cyclone
2 Ugly threatening sky
3 Duststorm or sandstorm
4 Fog or ice fog
5 Waterspout
6 Cirrostratus shield or bank
7 Altostratus or altocumulus shield or bank
8 Line of heavy cumulus
9 Cumulonimbus heads or thunderstorms

TABLE 17 I_r

7 Light
8 Moderate
9 Severe
/ Unknown or contrails

TABLE 18 I_t

0 None
1 Rime ice in clouds
2 Clear ice in clouds
3 Combination rime and clear ice in clouds
4 Rime ice in precipitation
5 Clear ice in precipitation
6 Combination rime and clear ice in precip
7 Frost (icing in clear air)
8 Nonpersistent contrails *(less than 1/4 nautical miles long)*
9 Persistent contrails

TABLE 19 S_r, E_w, E_1

0	0NM	5	50NM
1	10NM	6	60–80NM
2	20NM	7	80–100NM
3	30NM	8	100–150NM
4	40NM	9	Greater than 150NM
		/	Unknown

TABLE 20 O_e

0 Circular
1 NNE – SSW
2 NE – SW
3 ENE – WSW
4 E – W
5 ESE – WNW
6 SE – NW
7 SSE – NNW
8 S – N
/ Unknown

TABLE 21 c_e

1 Scattered Area
2 Solid Area
3 Scattered Line
4 Solid Line
5 Scattered, all quadrants
6 Solid, all quadrants
/ Unknown

TABLE 22 i_e

2 Weak
5 Moderate
8 Strong
/ Unknown

TABLE 23 V_i

1 Inflight visibility 0 to and including 1 nautical mile
2 Inflight visibility greater than 1 and not exceeding 3 nautical miles
3 Inflight visibility greater than 3 nautical miles

RECCO SYMBOLIC FORM

SECTION ONE (MANDATORY)
$9XXX9\ GGggi_d\ YQL_aL_aL_a\ L_oL_oL_oBf_c\ h_ah_ah_ad_rd_a$
$ddfff\ TTT_dT_dw\ /jHHH$

SECTION TWO (ADDITIONAL)
$Ik_nN_sN_sN_s\ Ch_sh_sH_tH_t\ .....\ .....\ 4ddff$
$6W_sS_sW_dd_w\ 7I_rI_tS_bS_e\ 7h_jh_j\ H_jH_j\ 8d_rd_rS_rO_e$
$8E_wE_1c_ei_e\ 9V_jT_wT_wT_w$

SECTION THREE (INTERMEDIATE)
$9XXX9\ GGggi_d\ YQL_aL_aL_a\ L_oL_oL_oBf_c\ h_ah_ah_ad_rd_a$
$ddfff\ TTT_dT_dw\ /jHHH$

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CHAPTER 5
APPENDIX C

AIRCRAFT RECONNAISSANCE COMMUNICATIONS

1. General. USAF and NOAA aircraft will normally transmit reconnaissance observations via HF radio through USAF Aeronautical Stations to the appropriate weather reconnaissance data monitor. Monitors will evaluate these reports and disseminate them to either the AWN, Carswell AFB, TX or the weather communications facility at Suitland, MD.

2. Air Ground Communications. The weather reconnaissance crew will relay weather data via direct phone patch to the weather monitor through the appropriate USAF aeronautical station, as listed in en-route flight publications. When requested, Aeronautical Stations will provide a discrete frequency for mission use, if possible. Specific radio procedures and terminology will comply with Allied Communications Publication (ACP) 125. Because of the perishable nature and potential operational impact of weather data, USAF has authorized the use of "Immediate" precedence for transmission of hurricane reconnaissance data. Data will be routed as follows:

a. Primary: Direct phone-patch between aircraft and Miami Monitor (Atlantic and Eastern Pacific) or Hickam Weather Monitor (Central Pacific).

b. Secondary: Direct phone-patch between aircraft and any weather monitor.

3. Air-to-Air Communications. When more than one reconnaissance aircraft is known to be operating in a particular area of interest, the following frequencies will be used for plane-to-plane communications and coordination:

a. Primary: VHF 123.05 MHz.

b. Secondary: UHF 304.8 MHz

c. Back-up: HF 4701 KHz USB

4. Aircraft Satellite Data Link (ASDL) Equipped Aircraft. Aircraft equipped with ASDL have the option to utilize the ASDL system using the following procedures:

a. Data Format. The following format will be used for data transmission by the ASDL System:

(1) One Minute Observation - All locations

(Message Header)	(Date/Time)
URNT40 KMIA	291630
(Platform Identifier)	(Date/Time-NESDIS)
15C9419C	23012 3220
(Mission Identifier)	
NOAA2 0401 ANA	

(TIME)	(LATITUDE)	(LONGITUDE)	(PRESS ALT)	(D VALUE)
1233	2803	08037	06173	+0436

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(WIND) (TEMP) (DP)
213010 ±138 ±096
NNNN

(2) RECCO Observation - Atlantic Area
(Message Header) (Date/Time) Same as for 1 minute observation.
(Platform Identifier) (Date/Time-NESDIS) - Same as for 1 minute observation.
(Observation Manop Heading) (Date/Time)
URNT11 KMIA 281642
NOAA2 0401 ANA OB 03
(RECCO text)
97779 12428.....93275
NNNN

(3) RECCO Observation - Eastern and Central Pacific - Same as for Atlantic except that observation manop heading is URPN11 KMIA.
Note: 11 used for routine tropical cyclone observation
12 used for vortex reports, etc.

b. Data Transmission Schedule. To facilitate the transmission of data from several aircraft through one circuit, each aircraft will be assigned a specific block of time within the 30-minute interval for transmission of its data using the following schedule:

0—— +5	+5—— +10 OAO 42RF P-3(A)	+10—— +15 OAO 43RF P-3(B)	+15—— +20
+20—— +25 RADAR	+25—— +30 RADAR	+30—— +35	+35—— +40 OAO 42RF P-3(A)
+40—— +45 OAO 43RF P-3(B)	+45—— +50	+50—— +55 RADAR	+55—— +60 RADAR

Because only 4 minutes and 28 seconds of each 5-minute time block can be used for data transmission, roughly 1/2 minute is left in each transmission block. This schedule is designed to eliminate diagnostic statements that would appear at the NESDIS computer if data from specific sources arrived at the computer at unscheduled times.

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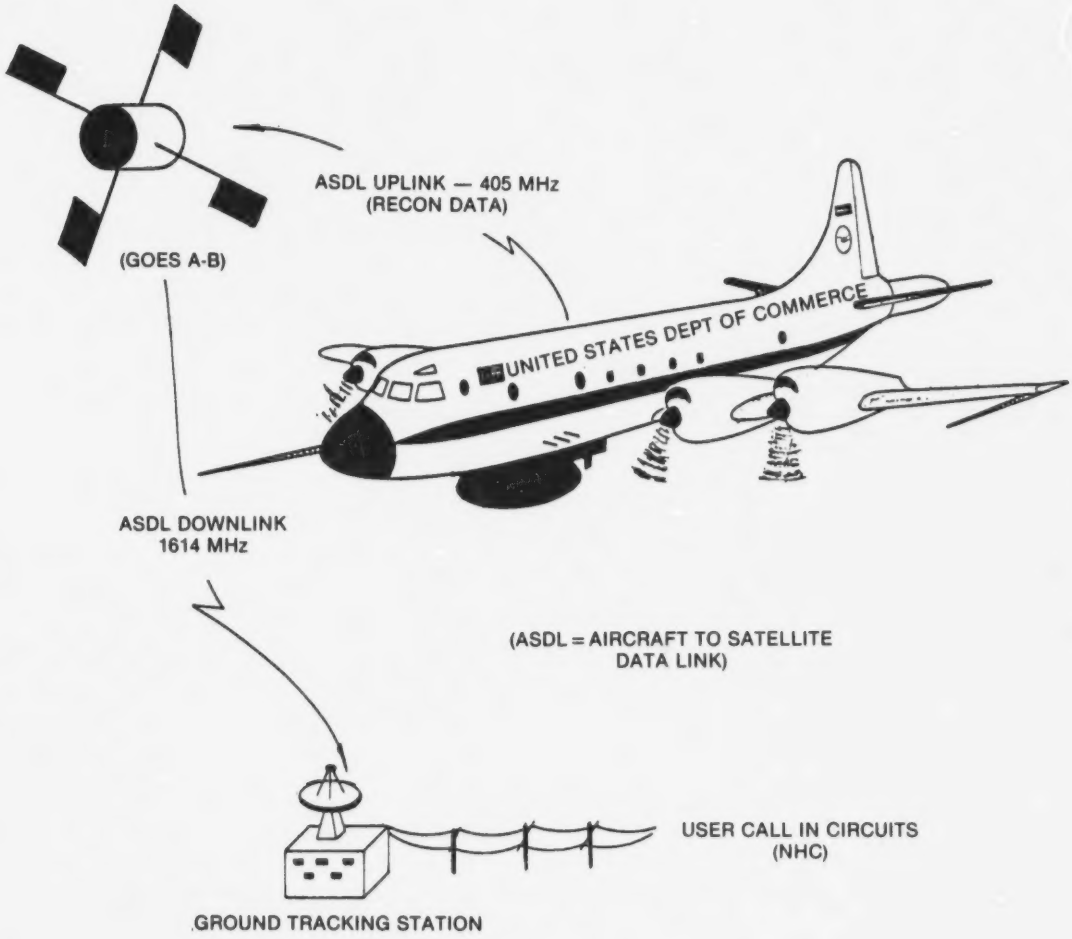
c. Data Transmission Test - Prior to the beginning of the hurricane season (June), each aircraft equipped with ASDL will perform a ground or airborne test of the equipment and data ground handling procedures to determine the equipment reliability, transmission errors, and time lapse between transmission of the data from the aircraft and receipt of the data by the hurricane forecaster. Test data will be forwarded to the Chairman of the Working Group for Hurricane and Winter Storms Operations.



Schematic of the Aircraft to Satellite Data Link (ASDL)
on NOAA P-3 Aircraft

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RECONNAISSANCE ORGANIZATION COMMUNICATION CAPABILITIES

STATION	ADDRESS	TELETYPE	TELEPHONE
Federal Coordinator for Meteorology (OFCM)	Suite 300, 11426 Rockville Pike Rockville, MD 20852	-	AV 851-1460 CO 301-770-3464 FTS 443-8704
CARCAH/MIAMI Monitor	OL-G, AWS Coral Gables, FL	A B C	AV 894-3430 CO 305-666-4612 FTS 350-5547 AV 894-1150 (phone patch only)
Mather Weather Monitor	Det 7, 24 WS Mather AFB, CA	B	AV 828-4377
Hickam Weather Monitor	Det 4, 20 WS Hickam AFB, HI	B	AV 315-449-1279/6283
National Hurricane Center	Nat'l Hurricane Center Coral Gables, FL	A B C	CO 305-667-3108 FTS 350-5547
Alternate National Hurricane Center	WSFO Washington, DC	A C	CO 301-899-3152 FTS 763-8088
	WSFO New Orleans, LA	A C	CO 504-522-7330 FTS 682-6891
Eastern Pacific Hurricane Center	WSFO Redwood City, CA	C	CO 415-364-4610 FTS 466-7767
Central Pacific Hurricane Center	WSFO Honolulu, HI	C	CO 808-836-1831 FTS 546-2853
Naval Eastern Oceanography Center, Norfolk	NAVEASTOCEANCEN Norfolk, VA	B	AV 564-7750/3770 FTS 954-7750/3770
Naval Western Oceanography Center, Pearl Harbor	NAVWESTOCEANCEN Pearl Harbor, HI	B	AV 315-430-0111 (ask for 471-0004)
Office of Aircraft Operations	OAO Miami, FL		CO 305-526-2936 FTS 350-2936 AV 894-1600
Det 1, 7WW	Det 1, 7WW Keesler AFB, MS		AV 868-2544
AF Global Weather Central	AFGWC Offutt AFB, NE	B	AV 271-2586 FTS 866-2586
CINCLANTFLT OAC	CINCLANTFLT OAC Oceana, VA		AV 433-2851 Ext. 233 CO 804-433-2851 Ext. 233
ARTCC Miami	ARTCC Miami, FL	C	AV 894-1910
53 WRS	53 WRS Keesler AFB, MS		AV 868-4540 CO 601-377-4540
815 WRS	815 WRS Keesler AFB, MS		AV 868-4318 CO 601-377-4318

A - GT7072
B - COMEDS
C - AFTN

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CHAPTER 6

SATELLITE SURVEILLANCE OF TROPICAL AND SUBTROPICAL CYCLONES

1. Satellites.

a. Geostationary Operational Environmental Satellite (GOES). The GOES system currently consists of one operational spacecraft, GOES-6 at 108 degrees west. GOES-6 will move to 98 degrees west late spring of 1985 and return to 108 degrees west in November of 1985. The principal GOES products are 1/2-hourly pictures with implanted grids automatically applied to all sectors. During daylight hours, approximately 1, 2, and 4 km resolution fixed standard sectors are produced. During the night (also available in daylight), the same geographical coverage standard sectors are produced with 7 Km resolution infrared (IR). The IR data may be enhanced to emphasize various features. Floating sectors which are scheduled by the Satellite Field Services Stations (SFSS's) are produced to augment the standard sector coverage support. All products are delivered in near real time to the National Environmental Satellite, Data and Information Service (NESDIS) Synoptic Analysis Branch (SAB), the SFSS's, and Weather Service Forecast Offices (WSFOs). (See GOES Operational Data Flow, Appendix A, Attachment 1; Satellite Data Availability, Appendix A, Attachment 2.)

b. NOAA Polar-Orbiting Satellites. These satellites cross the U.S. twice daily near the equatorial crossing times as indicated in Appendix A, Attachment 2. Data are available via direct read-out (HRPT and APT) or central processing. AVHRR data are available on a limited basis through the GOES distribution system. The Air Force Global Weather Central (AFGWC) Offutt AFB, NB, receives global NOAA imagery data direct from central readout sites on pass by pass basis. Data are processed in mapped and unmapped form for use internally.

2. Satellite Field Services Stations (SFSS).

a. Support Concept. GOES imagery in support of the hurricane warning service is distributed to the Central Data Distribution Facility (CDDF) at Marlow Heights, MD, to the SFSS's in Miami, San Francisco, Washington, New Orleans, and Honolulu. These SFSS's are colocated with NWS hurricane warning offices and are responsible for providing direct satellite support to the warning center. This support includes the use of floating sectors at 1, 2, and 4 km visible and 7 km IR positioned over the storm area. SFSS's and SAB routinely provide classification of storms using Dvorak Techniques for both visible and IR data.

b. Station Contact. SFSS satellite meteorologists can be contacted as follows:

(1) Miami - 24 hours a day at (305) 350-4460 or FTS 350-4460.

(2) San Francisco - 24 hours a day at (415) 876-9122/23 or FTS 470-9122/9123.

(3) Honolulu - 24 hours a day at (808) 836-2776.

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(4) Washington - 24 hours a day at (301) 763-8239 or FTS 763-8425.

(5) New Orleans - 24 hours a day at (504)649-5130 or FTS 682-2807.

c. Satellite Tropical Disturbance Summary. The Miami, San Francisco, and Honolulu SFSS's distribute twice daily at the times indicated (Appendix B, Form 1 to this Chapter) a satellite summary which describes significant weather in the tropical regions of the Atlantic, Eastern Pacific, and Central Pacific (north and south between 140°W to 100°E, respectively).

3. NESDIS Synoptic Analysis Branch (SAB). SAB operates 24 hours a day to provide satellite support to the National Meteorological Center (NMC). The SAB also distributes twice daily a "Satellite Tropical Disturbance Summary for the Pacific (West of 170°E) and the Indian Ocean." SAB may be contacted at (301) 763-8444 or FTS 763-8444.

4. AFGWC Support and the Defense Meteorological Satellite Program (DMSP). AFGWC uses all available METSAT data when providing fix information. DMSP will provide coverage of tropical/subtropical cyclones whenever possible. Data covering the National Hurricane Operations Plan (NHOP) areas of interest will be received centrally at the AFGWC and locally at the direct readout site at Hickam AFB, HI.

a. North Atlantic and Central Pacific Surveillance. AFGWC readouts will augment NESDIS surveillance for the North Atlantic and Central Pacific. AFGWC will transmit teletype bulletins describing the location and intensity classification of the system (in the format shown in Appendix B, Form 2) to the NHC or CPHC as appropriate, on organized disturbances evident at the Tropical Classification - 1 (T-1) level or higher.

b. Eastern Pacific Surveillance. If EPHC determines the coverage from available NESDIS satellites should be supplemented, they will request the data from AFGWC.

5. Satellites and Satellite Data Availability for the 1984 Hurricane Season. Appendix A, Attachment 2 of this chapter lists satellite capabilities for the 1985 hurricane season.

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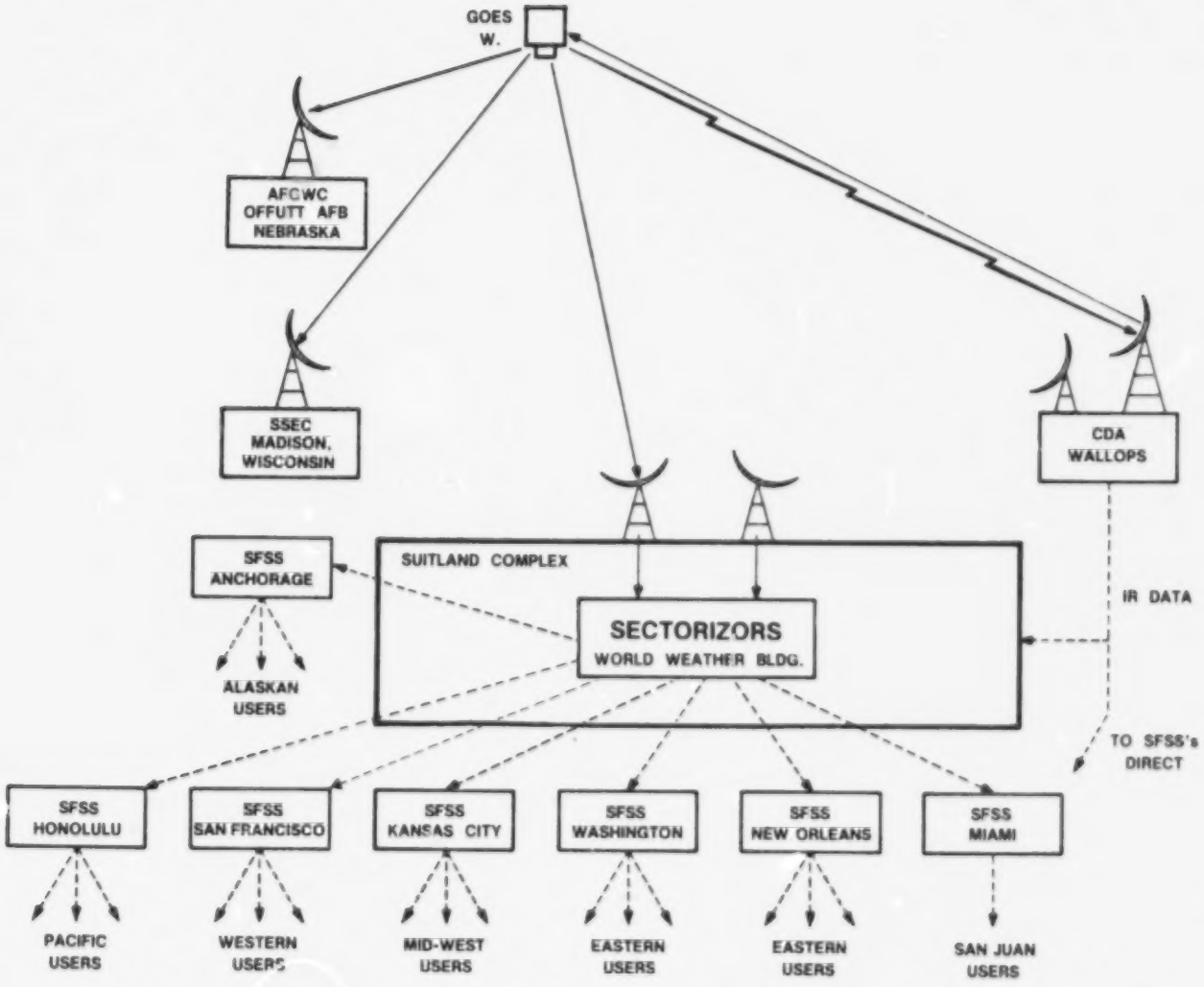
GOES

OPERATIONAL DATA FLOW



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SATELLITES AND DATA AVAILABILITY FOR 1985 HURRICANE SEASON

Satellite	Type of Data	Local Time	Remarks
GOES-6 - 98.0 W 4 Spacecraft (standby) limited operational capability	VISSR VAS	Every 30 minutes (24 hr/day) (Limited scan for short-interval viewing available)	1. 1, 2, and 4 km resolution visible standard sectors covering Western United States, Midwest and Eastern United States (daylight). 2. 9 km resolution equivalent IR standard sectors for the entire United States (night). 3. Equivalent IR-enhanced imagery. 4. Floating sectors at 1, 2, and 4 km resolution (visible) (equivalent IR 7 km). 5. Full disc IR (day and night). 6. Movie loops 7. Wind analysis 8. Cloud top heights
NOAA-6	AVHRR GAC and LAC (recorded) HRPT and APT (direct) TOVS	0740/1940	1. Mapped digitized data (cloud cover 2. Unmapped imagery (all data types) at DMSP sites. 3. Sea-surface temperature analysis 4. Moisture analysis 5. Soundings
NOAA-7		1430/0230	
NOAA-9	GAC and LAC (recorded) HRPT and APT (direct) TOVS	1430/0230	
DMSP	LF	0700/1900	1. Unmapped imagery (LF only) 2. Mapped imagery (none)

GAC - Global Area Coverage (recorded reduced resolution data for Central Processing)
LAC - Local Area Coverage (recorded high resolution data, limited amount)
TOVS - TIROS Operational Vertical Sounder
HRPT - High Resolution Picture Transmission (1.1 km)
LF - Light Fine (Visual Scanning Radiometer 0.3 nmi)
APT - Automatic Picture Transmission (4 km)
AVHRR - Advanced Very High Resolution Radiometer
VAS - VISSR Atmospheric Sounder
VISSR - Visible-Infrared Spin Scan Radiometer

CHAPTER 6
APPENDIX B
FORM 1

SAMPLE OF SATELLITE TROPICAL DISTURBANCE SUMMARY

ABXX15 KSFO 210800Z
ABXX( ) KWBC, KSFO, KMIA, PHNL
SATELLITE TROPICAL DISTURBANCE SUMMARY
ALL MOVEMENTS AND TRENDS 24 HOURS UNLESS OTHERWISE STATED

EAST PACIFIC	GOES WEST IR NITE	210745Z
(OCEANIC AREA)	(SATELLITE & SENSOR(S)	(PREPARATION TIME)

(Location) (Time) (Satellite Code) (Name and/or No.)

TROPICAL STORM SUSAN. SEE LATEST EPHC ADVISORY.

ITC 2 TO 4 DEGS WIDE XTNDG FM 6N 80W TO 11N 116W IS BRKN TO OCNLY OVC WITH HVST ACTIVITY ARND 11N 116W. SCTD ACTV ITC FM 9N 116W TO 12N 134W 2 DEG WIDE WAS BKN YDA. BRKN TO OVC AREA 3 TO 5 DEG IN DIA IS MDTLY ACTC CNTRD NEAR 11N 116W HAS MVD W 5 DEG WITH LTL CHG.

ATLANTIC	GOES EAST IR NITE	210630Z
(OCEANIC AREA)	(SATELLITE AND SENSOR(S))	(PREPARATION TIME)

(Location) (Time) (Satellite Code) (Name and/or No.)

NO TROPICAL CYCLONES OBSERVED

ITC 3 TO 5 DEG WIDE FM 10N 20W TO 14N 50W IS MSTLY BRKN AND MDTLY ACTV WITH LTL CHG. BRKN ACTV ITC FM 14N 50W TO 17N 57W 4 DEG WIDE HAS INCREASED IN WIDTH

(Heading)	(TIME)	(OCEANIC AREA)	(TYPE OF DATA)
*ABXX15 KMIA	0700Z	Atlantic/Caribbean	IR NITE
*ABXX11 KMIA	1900Z	Atlantic/Caribbeen	VIS/IR DAY
*TCPZ11 KSFO	0800Z	Eastern Pacific	IR NITE
*TCPZ10 KSFO	2000Z	Eastern Pacific	VIS/IR DAY
*TCPW11 PHNL	1000Z	Central Pacific (N&S 100E-175W)	IR NITE
*TCPW10 PHNL	2200Z	Central Pacific (N&S 100E-175W)	VIS/IR DAY
*TCPA11 PHNL	1000Z	Central Pacific (N&S 175W-140W)	IR NITE
*TCPA10 PHNL	2200Z	Central Pacific (N&S 175W-140W)	VIS/IR DAY
ABXX12 KWBC	1100Z	Indian Ocean	IR NITE
ABXX13 KWBC	0500Z	Western Pacific (N&S W of 170°E)	VIS
ABXX14 KWBC	2300Z	Indian Ocean	VIS/IR DAY
ABXX16 KWBC	1900Z	Western Pacific (N&S W of 170°E)	IR NITE

*Whenever a tropical system is located in these areas, Part 1 will carry the following statement: See latest (NHC, EPHC, or CPHC) advisory(ies).

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CHAPTER 6
APPENDIX B
FORM 2

CENTER FIX DATA FORM AND MESSAGE FORMAT (SATELLITE)

MESSAGE HEADING:
TPNT CCCC

A CYCLONE DESIGNATOR	A. Designator of tropical cyclone category including name/number. When a cloud system has not yet been designated by name/number enter TROPICAL DISTURBANCE. Sample entry: TROPICAL STORM AMY (15)
B DATE/TIME (Z) OF FIX	B. Date and nodal crossing time in Zulu; round time to nearest minute. Sample entry: 252303Z
C LATITUDE OF POSITION	C. Latitude to nearest tenth of degree (N or S), followed by checksum. Sample entry: 29.9N/0
D LONGITUDE OF POSITION	D. Longitude to nearest tenth of degree followed by checksum. Sample entry: 56.7 W/8
E POSITION CODE NUMBER	E. Enter Position Code number (PCN) and source of data (DMSP, NOAA 2, etc.). Spell out PCN number. Select PCN number from code below: GEOGRAPHICAL GRIDDING: ONE: eye fix; THREE: well defined circulation center; FIVE: poorly defined circulation center EPHEMERIS GRIDDING: TWO: eye fix; FOUR: well defined circulation center; SIX: poorly defined circulation center Sample entry: ONE/DMSP
F DVORAK CLASSIFICATION	F. Dvorak classification for storm intensity as described in NOAA technical Memorandum NESS 45 and IWW/TN-81/001. Dvorak classification will be made once each day and must be based on visual data. If a new Dvorak classification number cannot be derived, use the last reported number. Include in parenthesis the date and nodal time of the data on which the Dvorak analysis is based. Sample entry: T 4.5/4.5/D1.0/25HRS (252305Z)
G REMARKS	G. Include information, as appropriate, on data type, eye characteristics, spiral rainbands, unexpected changes in storm movement, departures from Dvorak (modelled) intensities, etc.

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CHAPTER 6
APPENDIX B

CURRENT INTENSITY AND "T" NUMBER
CLASSIFICATION TABLE

The current intensity (C.I.) number relates directly to the intensity of the storm. The empirical relationship between the C.I. number and a storm's wind speed is shown in this table.

The C.I. number is the same as the T-number (Tropical Classification number) during the development stages of a tropical cyclone, but is held higher than the T-number while a cyclone is weakening. This is done because a lag is often observed between the time a storm pattern indicates weakening has begun and the time when the storm's intensity decreases. An added benefit from this rule is the stability it adds to the analysis when short-period fluctulations in the cloud pattern occur. In practice, the C.I. number is not lowered until the T-number has shown weakening for 12 hours or more.

C.I. Number	MWS (Knots)	T-Number	MSLP (Atlantic)	MSLP (NW Pacific)
1	25K	1		
1.5	25K	1.5		
2	30K	2	1009 mb	1003 mb
2.5	35K	2.5	1005 mb	999 mb
3	45K	3	1000 mb	994 mb
3.5	55K	3.5	994 mb	988 mb
4	65K	4	987 mb	981 mb
4.5	77K	4.5	979 mb	973 mb
5	90K	5	970 mb	964 mb
5.5	102K	5.5	960 mb	954 mb
6	115K	6	948 mb	942 mb
6.5	127K	6.5	934 mb	929 mb
7	140K	7	921 mb	915 mb
7.5	155K	7.5	906 mb	900 mb
8	170K	8	890 mb	884 mb

The empirical relationship between the current intensity (C.I.) number and the maximum wind speed (MWS), and the relationship between the T-number and the minimum sea level pressure (MSLP).

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CHAPTER 7

SURFACE RADAR REPORTING

1. General. Radar observations of tropical cyclones will be made at Department of Defense (DOD), National Weather Service (NWS), and Federal Aviation Administration (FAA) radar facilities and at other cooperating radar facilities according to established agreements with NWS.

2. Procedures.

a. Radar observation of tropical cyclones will be made in accordance with the Federal Meteorological Handbook (FMH) No. 7, Part A, Weather Radar Observations. Stations that normally transmit hourly radar weather observations (network stations) will include tropical cyclone features in routine reports (H+35) and will make and transmit special observations at H+10 whenever an eye or center is observed. It is highly desirable for stations that do not normally transmit hourly reports (local warning radars) to make and transmit a radar observation whenever an eye, center, or spiral band is observed. The local warning radar sites may transmit only abbreviated special observations, defined in FMH-7, at H+10 and H+35.

b. If the central region of a storm is defined by an identifiable wall cloud; the radar fix is reported as an EYE. If the central region is recognizable, but not well defined by a wall cloud, it is reported as a CENTER. When the EYE or CENTER is only occasionally recognizable or some other central region uncertainty exists, the EYE or CENTER is reported as PSBL EYE or PSBL CENTER. Remarks stating degree of confidence will be included with EYE fixes only and will be classified as either GOOD, FAIR, or POOR. A GOOD fix is reported when the EYE is symmetrical - virtually surrounded by wall cloud; a POOR fix is reported when the EYE is asymmetrical - less than 50 percent surrounded by wall cloud; a FAIR fix is reported to express a degree of confidence between GOOD and POOR.

c. Timely transmission of tropical cyclone radar reports is essential. Normally, radar reports are transmitted over the Automation of Field Operations and Service (AFOS) System, or CONUS Meteorological Data System (COMEDS) circuit equipment. Those radar facilities not having weather transmission capability may call the nearest Weather Service Office (WSO) collect.

3. Special Provisions.

a. If NWS network weather radars (WSR 57 and selected WSR-74s) and DOD weather radar facilities are collocated (within 25 nautical miles), the NWS radar will have the primary responsibility for making and transmitting tropical cyclone radar reports - DOD will provide backup service. If a radar facility is less powerful than the WSR 57 and is collocated with North American Aerospace Defense Command (NORAD) long-range radar facility, the NORAD long-range radar facility will have the primary responsibility for making and transmitting tropical cyclone radar reports provided it is manned by a qualified weather radar operator, the less powerful radar facility will provide backup service. Any backup radar facility, however, may transmit radar reports as desired.

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b. If radar reports are needed from NORAD long-range radar facilities NWS will dispatch weather radar specialists to these facilities to make and transmit tropical cyclone radar observations. DOD has authorized the Director, NWS, to dispatch NWS radar specialists to NORAD sites during critical hurricane threat situations to make and transmit hurricane radar observations. Specific procedures regarding notification, access to sites, clearances, etc., as agreed to by DOD and NWS will be the responsibility of the Severe Weather Branch, Operations Division, NWS Headquarters, and will be strictly adhered to.

c. Air Weather Service staff weather officers providing support to NORAD long-range radar units act as coordinators for visits. These coordinators are: Commander, Det. 9, 3 Weather Sq., 23rd NORAD Regional Operations Control Center (ROCC), Tyndall AFB, FL. (904) 283-2856; Commander Det. 8, 26 Weather Sq., 24 NORAD ROCC, Griffiss AFB, NY (314) 330-2410; Commander, Det. 4, 20 Weather Squadron, Hawaii ROCC(HIROCC), Hickam AFB, HI (315-449-6262). Sites are listed in Appendix A of this chapter.

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CHAPTER 7
APPENDIX A
PARTICIPATING RADAR STATIONS

National Weather Service	Radar	Latitude	Longitude
Apalachicola, FL	WSR-57	29°44'N	84°59'W
Atlantic City, NJ	WSR-57	39°27'N	74°35'W
Baton Rouge, LA#	WSR-74C	30°32'N	91°09'W
Brownsville, TX	WSR-57	25°54'N	97°26'W
Cape Hatteras, NC	WSR-57	35°16'N	75°33'W
Charleston, SC	WSR-57	32°54'N	80°02'W
Chatham, MA	WSR-74S	41°39'N	69°57'W
Corpus Christi, TX#	WSR-74C	27°46'N	97°30'W
Daytona Beach, FL	WSR-57	29°11'N	81°03'W
Galveston, TX	WSR-57	29°18'N	94°48'W
Jackson, MS	WSR-57	32°19'N	90°05'W
Key West, FL	WSR-57	24°33'N	81°45'W
Lake Charles, LA	WSR-57	30°07'N	93°13'W
Los Angeles, CA#	WSR-74C	34°03'N	118°27'W
Miami, FL	WSR-57	25°43'N	80°17'W
Mobile, AL#	WSR-74C	30°41'N	88°15'W
Mt Laguna, CA	FPS-7	32°53'N	116°25'W
New York, NY	WSR-57	40°46'N	73°59'W
Patuxent, MD	WSR-74S	38°17'N	76°25'W
Pensacola, FL	WSR-57	30°21'N	87°19'W
Portland, ME	WSR-57	43°39'N	70°18'W
San Juan, PR	FPS-67*	18°16'N	65°46'W
San Padro, CA	ARSR	33°45'N	118°20'W
Savannah, GA	WSR-74C	32°08'N	81°12'W
Slidell, LA	WSR-57	30°17'N	89°46'W
Tampa, FL	WSR-57	27°42'N	82°24'W
Victoria, TX#	WR-100-5	28°51'N	96°55'W
Volens, VA	WSR-74S	36°57'N	79°00'W
Waycross, GA	WSR-57	31°15'N	82°24'W
West Palm Beach, FL#	WSR-74S	26°41'N	80°06'W
Wilmington, NC	WSR-57	34°16'N	77°55'W

*FAA-U.S. Navy Joint-Use Radar.
#Local Warning Radar

Department of Defense			
Andrews AFB, MD	FPS-77	38°48'N	76°53'W
Barksdale AFB, LA	FPS-77	32°30'N	93°40'W
Bermuda NAS	FPS-106	32°22'N	64°41'W
Cape Canaveral AFS, FL	FPS-77	28°28'N	80°33'W
Chase Field NAS, Beeville, TX	FPS-106	28°22'N	97°40'W
Cherry Point MCAS, NC	FPS-106	34°54'N	76°53'W
Corpus Christi NAS, TX	FPS-106	27°42'N	97°16'W
Eglin AFB, FL	FPS-77	30°29'N	86°31'W
Homestead AFB, FL	FPS-77	25°29'N	80°23'W
Howard AFB, CZ	FPS-77	08°77'N	79°36'W
Jacksonville NAS, FL	FPS-106	30°14'N	81°41'W

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Keesler AFB, MS	FPS-77	30°24'N	88°55'W
MacDill AFB, FL	FPS-77	27°51'N	82°30'W
McGuire AFB, NJ	FPS-77	40°00'N	74°36'W
New Orleans NAS, LA	FPS-106	29°50'N	90°01'W
Norfolk NAVEASTOCEANCEN, VA	FPS-106	36°56'N	76°18'W
Pope AFB, NC	FPS-77	35°12'N	79°01'W
Randolph AFB, TX	FPS-77	29°32'N	98°17'W
Robins AFB, GA	FPS-77	32°38'N	83°36'W
Seymour Johnson AFB, NC	FPS-77	35°20'N	77°58'W
Guantanamo Bay Cuba, NAVOCEANCOMDET	FPS-106	19°54'N	75°10'W
Roosevelt Roads PR, NAVOCEANCOMDET	FPS-106	18°15'N	65°38'W

ADCOM Sites

23 NORAD Region Operations Control Center

	Latitude	Longitude
**OLAF, 23 ADS, Patrick AFB, FL	28°13'N	80°36'W
**OLAD, 23 ADS, Ft. Lonesome, FL	27°36'N	82°06'W
OLAJ, 23 ADS, Key West NAS, FL	24°35'N	81°41'W
**678 Radar Sq., Tyndall AFB, FL	30°05'N	85°37'W
701 Radar Sq., Ft. Fisher AFS, NC	33°59'N	77°55'W
OLAC, 23 ADS, Jedburg, SC	33°06'N	80°12'W

24 NORAD Region Operations Control Center

762 Radar Sq., North Truro AFS, MA	42°02'N	70°03'W
772 Radar Sq., Gibbsboro AFS, NJ	39°49'N	74°57'W
OLAA, 24 ADS, Sulfolk, NY	40°54'N	72°42'W
**OLAE, 24 ADS, Bucks Harbor AFS, ME	44°38'N	67°24'W

**Remoted in the FAA ARTCC

Hawaii Regional Operations Control Center

150 AC & W Sq, Kokee AFS, HI	22°09'N	159°39'W
169 AC & W Sq, Mt. Kaala AFS, HI	21°30'N	158°08'W

Cooperating Sites

Bay St. Louis, MS (NASA)	CPS-9	30°42'N	89°07'W
Cambridge, MA (Massachusetts Institute of Technology)	CPS-9 and M-33	42°42'N	71°06'W
College Station, TX (Texas A. & M. University)	CPS-9	30°37'N	96°21'W
Coral Gables, FL (University of Miami)	SP-1M and CPS-68	25°43'N	80°17'W
Wallops Station, VA (NASA)	MPS-19	37°50'N	75°29'W
	SPS-12	37°56'N	75°28'W
	FPS-16	37°50'N	75°29'W
	FPQ-6	37°52'N	75°31'W

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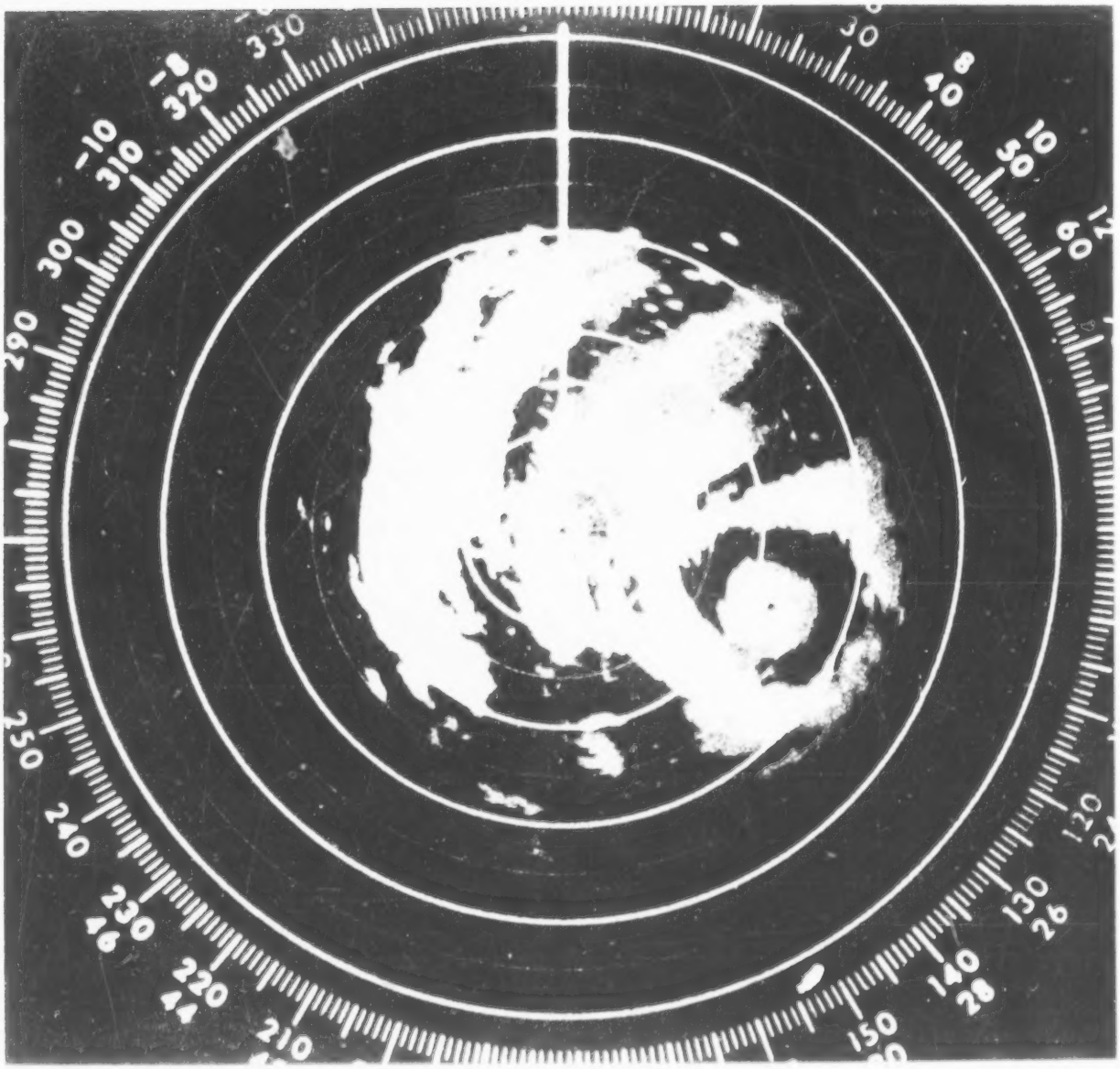
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CHAPTER 8

NOAA DATA BUOY CENTER REPORTING STATIONS

1. General. NOAA Data Buoy Center (NDBC) reporting stations in the Gulf of Mexico and Great Lakes, and off the U.S. east and west coasts, obtain data on meteorological and oceaonographic parameters for operational and research purposes. Station location and configuration are given in paragraph 4. The status and capability of stations can be obtained from the Data Systems Division, NOAA Data Buoy Center, NSTL Station, MS 39529, telephone: (601) 688-2836, FTS 494-2836. During non-working hours, NDBC can be contacted through the U. S. Coast Guard in New Orleans, LA, telephone: (504) 589-6225, or FTS 682-6225.

2. Procedures. Reporting stations routinely acquire, store, and transmit data every hour. Data obtained operationally include sea-level pressure, wind speed and direction, air temperature, sea-surface temperature, and wave spectral data.

3. Communications. Buoy and Coastal Marine Automated Network (C-MAN) data are transmitted by UHF communications via the GOES satellite to NESDIS and then are relayed on to NMC, Suitland, MD, for processing and dissemination. Moored buoy data are formatted into WMO FM 13/VII synoptic codes and C-MAN data are formatted into WMO FM 12 synoptic codes and operational drifting buoy data are routed in the WMO DRIBU code. These codes are defined in FMH-2, Surface Synoptic Codes.

4. NOAA Data Buoy, C-MAN Site Locations and Configuration

a. Gulf of Mexico

(1) Moored Buoys:

Station ID	°N/°W Location	Buoy Size	Sensor Height
42001	25.9/89.7	10M	10M
42002	26.0/93.5	10M	10M
42003	26.0/85.9	10M	10M
42007*	30.2/88.9	12M	10M
42009*	29.3/87.5	10M	10M

*Temporary sites established in support of other programs.

(2) C-MAN Sites:

Station ID	°N/°W Location	Station Name
BURL1	28.9/89.4	Southwest Pass, LA
CSBF1	29.7/85.4	Cape San Blas, FL
PTAT2	27.8/97.1	Port Aransas, TX
SRST2	29.7/94.1	Sabine, TX

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b. Atlantic Ocean

(1) Moored Buoys:

Station ID	°N/°W Location	Buoy Size	Sensor Height
41001	34.9/72.9	12M	10M
41002	32.3/75.3	6M	5M
41006	29.3/77.3	6M	5M
44004	38.5/70.7	12M	10M
44005	42.7/68.3	12M	10M
44007	43.5/70.1	12M	13M
44008	40.5/69.4	12M	13M
44009	38.5/74.6	12M	13M
44011	41.1/66.6	6M	5M
44012	38.8/74.6	12M	13M
44013	42.4/70.8	12M	13M

(2) C-MAN Sites

Station ID	°N/°W Location	Station Name
ALSN6	40.5/73.8	Ambrose Light, NY
ALRF1	24.9/80.6	Alligator Reef, FL
CHLV2	36.9/75.7	Chesapeake Light, VA
CLKN7	36.9/76.5	Cape Lookout, NC
DSLN7	35.2/75.3	Diamond Shoals, NC
FBIS1	32.7/79.9	Folly Island, SC
FPSN7	33.5/77.6	Frying Pan Shoals, NC
IOSN3	42.9/70.6	Isle of Shoals, NH
LKWF1	26.6/80.0	Lake Worth, FL
MDRM1	44.0/68.1	Mt. Desert Rock, ME
MISM1	43.8/68.9	Mantinicus Rock, ME
SJLF1	30.4/81.4	St. Johns Light, FL

c. Pacific Ocean.

(1) Moored Buoys:

Station ID	°N/°W Location	Buoy Size	Sensor Height
46011	34.9/120.9	10M	10M
46023	34.3/120.7	10M	10M
46024	32.8/119.5	10M	10M
46025	33.6/119.0	6M	5M
51001	23.4/162.3	6M	5M

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Station ID	$^{o}N/^{o}W$ Location	Buoy Size	Sensor Height
51002	17.2/157.8	6M	5M
51003	19.2/160.8	6M	5M
51004	17.5/152.5	6M	5M

(2) C-MAN Site:

Station ID	$^{o}N/^{o}W$ Location	Station Name
PIGC1	34.6/120.7	Point Arquello, CA

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CHAPTER 9

MARINE WEATHER BROADCASTS

1. General. The Department of Defense (DOD) and Department of Transportation (DOT) are responsible for broadcasting marine tropical cyclone advisories issued by the National Hurricane Center, the Eastern Pacific Hurricane Center and the Central Pacific Hurricane Center. Appendix A of this chapter lists the stations involved. The broadcasts are for the purpose of providing warnings to meet U.S. international obligations in Department of Commerce areas of forecast responsibility given in Chapter 2.

2. Broadcast Procedures. DOT and DOD will arrange for broadcast of all marine tropical cyclone advices immediately upon receipt. The latest tropical cyclone forecast will be transmitted according to the schedule and on the frequencies given in Worldwide Marine Weather Broadcasts. The latest position estimate will be used by DOT and DOD along with the latest forecast for storms on which position estimates are being issued. These broadcasts will be made in both voice and CW mode.

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CHAPTER 9

APPENDIX A

List of Marine Tropical Cyclone Forecast Broadcast Stations

Station Call Letters	Location
NMW	Astoria, OR
NMF	Boston, MA
NMO	Honolulu, HI
NMQ	Channel Island, CA
NMA	Miami, FL
NMG	New Orleans, LA
NAM	Norfolk, VA
NMN	Portsmouth, VA
NMC	San Francisco, CA
NMR	San Juan, PR

Note: All sites are DOT with the exception of "NAM", which is DOD.

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CHAPTER 10

PUBLICITY

News media releases, other than warnings and/or advisories for the purpose of informing the public of the operational and research activities of DOD, DOC, and DOT, should reflect the joint effort of these agencies by giving due credit to the participation of other agencies. Copies of these releases should be forwarded to:

NOAA, Office of Public Affairs
6010 Executive Boulvard
Rockville, MD 20852

Commander, Naval Oceanography Command
NSTL, MS 39529

Headquarters Military Airlift Command (MAC/PA)
Scott Air Force Base, IL 62225

Headquarters Air Force Reserve
Robins Air Force Base, GA 31093

Chief, Environmental Services Division (J-3)
The Joint Chiefs of Staff
Washington, DC 20301-5000

Federal Aviation Administration (AAT-150)
800 Independence Avenue, S.W.
Washington, D.C. 20591

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APPENDIX I

ACRONYMS AND ABBREVIATIONS
AS USED IN THIS PLAN

ACP	Allied Communications Publication
ADCOM	Aerospace Defense Command
AFB	Air Force Base
AFGWC	Air Force Global Weather Central
AFTN	Aeronautical Fixed Telecommunications Network
AFRES	Air Force Reserves
AJTWC	Alternate Joint Typhoon Warning Center
APT	Automatic Picture Transmission
ASDL	Aircraft Satellite Data Link
ATC	Air Traffic Control
AVHRR	Advanced Very High Resolution Radiometer
AWN	Automated Weather Network
AWS	Air Weather Service
CARCAH	Chief, Aerial Reconnaissance Coordination, All Hurricanes
COMEDS	Continental U.S. Meteorological Data System
CONF	Confidence Factor
CPHC	Central Pacific Hurricane Center
CW	Continuous Wave
DCS	Data Collection System
DMSP	Defense Meteorological Satellite Program
DOC	Department of Commerce
DOD	Department of Defense
DOT	Department of Transportation
EDB	Environmental Data Buoy
ELT	Eastern Local Time
EPHC	Eastern Pacific Hurricane Center
ERL	Environmental Research Laboratories
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
FAA	Federal Aviation Administration
FCM	Federal Coordinator for Meteorology
FMH	Federal Meteorological Handbook
FOFAX	Forecast Office Facsimile
GOES	Geostationary Operational Environmental Satellite
GMT	Greenwich Mean Time
HF	High Frequency
HWO	Hurricane Warning Office
ICAO	International Civil Aviation Organization
IR	Infrared
ITOS	Improved TIROS Operational Satellite
JTWC	Joint Typhoon Warning Center
LF	Light Fine (Visual Scanning Radiometer 0.3 n mi)
LS	Light Smooth (Visual Scanning Radiometer 1.5 n mi)
MAC	Military Airlift Command
MIC	Meteorologist in Charge
MOU	Memorandum of Understanding
MSD	Meteorological Services Division
NAM	Navy Communications Area Master Station Atlantic

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NASA	National Aeronautics and Space Administration
NAVEASTOCEANCEN	Naval Eastern Oceanography Center
NAVOCEANCOMDET	Naval Oceanography Command Detachment
NAVWESTOCEANCEN	Naval Western Oceanography Center
NDBC	NOAA Data Buoy Center
NESDIS	National Environmental Satellite, Data and Information Service
NHC	National Hurricane Center
NHOP	National Hurricane Operations Plan
NLT	Not Later Than
NMC	National Meteorological Center
NOAA	National Oceanic and Atmospheric Administration
NORAD	North American Aerospace Defense Command
NPSU	National Public Service Unit
NRCC	North American Air Defense Command Regional Control Center
NWS	National Weather Service
OAO	Office of Aircraft Operations
OL-G	Operating Location G
PM	Preventive Maintenance
RAWARC	Radar Report and Warning Coordination
RECCO	Reconnaissance Code
SAB	Synoptic Analysis Branch
SFSS	Satellite Field Services Station
SMS	Synchronous Meteorological Satellite
SR	Scanning Radiometer
SSH	Saffir/Simpson Hurricane
SST	Sea Surface Temperature
TCPOD	Tropical Cyclone Plan of the Day
TD	Tropical Depression
TF	Thermal Fine (Infrared Scanning Radiometer 0.3 n mi)
TS	Thermal Smooth (Infrared Scanning Radiometer 1.5 n mi)
UHF	Ultra High Frequency
US	United States
USAF	United States Air Force
USCG	United States Coast Guard
USN	United States Navy
VIS	Visible
VISSR	Visible - Infrared Spin Scan Radiometer
VTPR	Vertical Temperature Profile Radiometer
WMO	World Meteorological Organization
WRG	Weather Reconnaissance Group
WRS	Weather Reconnaissance Squadron
WSFO	Weather Service Forecast Office
WSO	Weather Service Office
WSOM	Weather Service Operations Manual
WSR	Weather Surveillance Radar
Z	Zulu (Coordinated Universal Time)

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APPENDIX II

BIBLIOGRAPHY OF OFFICIAL
INTERAGENCY AGREEMENTS

The following references are pertinent to the agreed interagency responsibilities designated in this plan:

1. Memorandum of Understanding (MOU) between the Department of the Air Force (DAF) and the National Oceanic and Atmospheric Administration (NOAA), dated March 16, 1976. Purpose: to establish policies, principles and procedures under which the DAF will provide aircraft weather reconnaissance to NOAA.

2. MOU between Military Airlift Command (MAC) and the Director of Operations, Logistics and Emergency Planning (NOAA), dated October 12, 1976. Purpose: to establish procedures by which NOAA will reimburse MAC and AFRES for airborne weather reconnaissance.

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APPENDIX III

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National Weather Service	
Gramax Building	57
World Weather Building	9
NOAA Data Buoy Center	23
National Hurricane Center	20
Eastern Region Headquarters	50
Central Region Headquarters	16
Southern Region Headquarters	50
Western Region Headquarters	50
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DCS for Aviation
(Code ASL-44)
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Scott AFB, IL 62225 — 35

Department of the Air Force
ATTN: Assistant for Joint and
NSC Matters, DCS/P&O
Washington, DC 20330 — 3

OL G, HQ AWS
National Hurricane Center
Gables One Tower
1320 S. Dixie Highway
Coral Gables, FL 33146 — 20

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Washington, DC 20361 — 2

HQ, Department of the Army
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Director, Naval Oceanography
Division (CNO/OP-952)
Naval Observatory, Building 1
34th & Massachusetts Ave., NW
Washington, DC 20390 — 2

Commanding Officer
Naval Oceanography Command Facility
P. O. Box 85
Naval Air Station
Jacksonville, FL 32212 — 2

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Otis AFB, MA 02542
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Elizabeth City, NC 27909
1

Commander
Eleventh Coast Guard Disrict
Union Bank Building
400 Oceangate
Long Beach, CA 90822
1

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Twelfth Coast Guard District
Government Island
Alameda, CA 94501
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Fourteenth Coast Guard District
Prince Kalanianaole Federal Bldg.
300 Ala Moana Blvd., 9th Floor
Honolulu, HI 96850
2

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Training Center
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c/o Naval Air Station
New Orleans, LA 70143
1

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U.S. Coast Guard Air Station
Corpus Christi, TX 78419
1

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U.S. Coast Guard Air Station
2710 Harbor Drive
San Diego, CA 92101
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Marshall Space Flight Center
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Mr. James B. Norton
Federal Aviation Administration
ATR-150
800 Independence Avenue, SW
Washington, DC 20591 — 1

Dr. Ronald C. Taylor
Director, Meteorology Program
National Science Foundation
1800 G Street, N.W.
Washington, D.C. 20550 — 1

Mr. Lewis T. Moore
Department of Interior
Bureau of Reclamation
Office of Liaison -
Engineering & Research
Washington, D.C. 20240 — 1

South Florida Water Management
District
P.O. Box V
West Palm Beach, FL 33402 — 1

Commander
Atlantic Area, U.S. Coast Guard
Governors Island
New York, NY 10004 — 2

Commander
First Coast Guard District
150 Causeway Street
Boston, MA 02114 — 1

Base Meteorological Officer
CFB Shearwater
BON 1B0
CANADA — 1

Dr. I. J. W. Pothecary
Assistant Director, Head of
Defense Services
Meteorological Office
London Road
Bracknell Berkshire RG122SZ
United Kingdom — 1

Mr. Richard Hayes
Commandant (G-OIO)
USCG Headquarters
Washington, DC 20593 — 1

Commandant
USCG Headquarters (G-OIO)
2100 Second Street, SW
Washington, DC 20593 — 2

Commandant
U.S. Coast Guard (G-TGC-1)
(ATTN: FLAGPLOT)
2100 Second Street, SW
Washington, DC 20593 — 1

Mr. John Bunting
Regional Office of Audits, OIG
Department of Commerce, Room 2241
1020 - 15th Street
Denver, CO 80202 — 1

Commander
Pacific Area, U.S. Coast Guard
Government Island
Alameda, CA 94501 — 2

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Training Center
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Oceanic, VA 23460

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Naval Eastern Oceanography Center
McAdie Building (U-117)
Naval Air Station
Norfolk, VA 23511

Commanding Officer 5
Naval Western Oceanography Center
Box 113
Pearl Harbor, HI 96860

NOAA Budget Officer 1
Office of Management & Budget
New Executive Office Bldg., Rm. 9217
Washington, DC 20503

Chief, Science & Technology Staff 1
Department of Interior
Washington, DC 20240

Head, Atmospheric Research Section 1
National Science Foundation
1800 G Street, NW
Washington, DC 20550

Dr. Robert E. Morrison 1
Congressional Research Service
Library of Congress
Washington, DC 20540

Mr. Irwin Plitt 1
c/o CWP Project Office
Mail Stop 502-419
Jet Propulsion Laboratory
4800 Oak Grove
Pasadena, CA 91109

Mr. Glen Glassburn 1
FAA - APM-640
800 Independence Avenue, SW
Washington, DC 20591

NAVOCEANCOMDEC 1
Naval Air Station
P. O. Box 3084
FPO Miami, FL 34051

Officer in Charge 1
METO Centre
Maritime Command Headquarters
FMO Halifax, Nova Scotia
CANADA

Base Meteorological Officer 1
CFB Greenwood
Greenwood, Nova Scotia
CANADA

Base Meteorological Officer 1
CFB Summerside
Slemon Park, P.E.I.
CANADA

Director 1
Canadian Meteorological Centre
Atmospheric Environment Service
4905 Dufferen Street
Downsview, Ontario M3H 5T4
CANADA

Director, Canadian Meteorological Centre 1
Atmospheric Environment Service
2121 N. Service Road, Suite 404
Dorval, Quebec H9P 1J3
CANADA

Regional Director, Atlantic Region 1
Atmospheric Environment Service
P.O. Box 5000
Bedford, Nova Scotia BON 1B0
CANADA

* U.S. Government Printing Office : 1985 -461-155/20151

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